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Ore Formation in the Wonder District, Nevada

The Silver Minerals Are Found in Lines Following the Direction of the Veins Which Vary from a Fractured Zone to a Solid Quartz Lode

BY ETIENNE A. RITTER*

The Wonder mining district is situated a little south of the center of Churchill county, Nevada. It is reached by stage from Fallon, on a branch of the Southern Pacific railroad, the distance from Fallon being 55 miles. Wonder is 12 miles from the mining camp of Fairview. It is situated on rolling hills on the western slope of the Augusta mountains, which belong to the Basin ranges. These mountains form a long and narrow ridge, bearing almost directly north and south, with a gentle slope to the east and a steep slope to the west. They were formed by the tilting of a block of strata along a line of deep faulting. Along this line of great faulting enormous masses of eruptive rocks have been poured out, and among them the trachytes and the rhyolites which form the hills of the Wonder district. During a later geological period the large, sandy valley into which the Wonder hills descend, was an arm of an immense inland sea. Today its dry bottom is a desert expanse.

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Rocks and Minerals

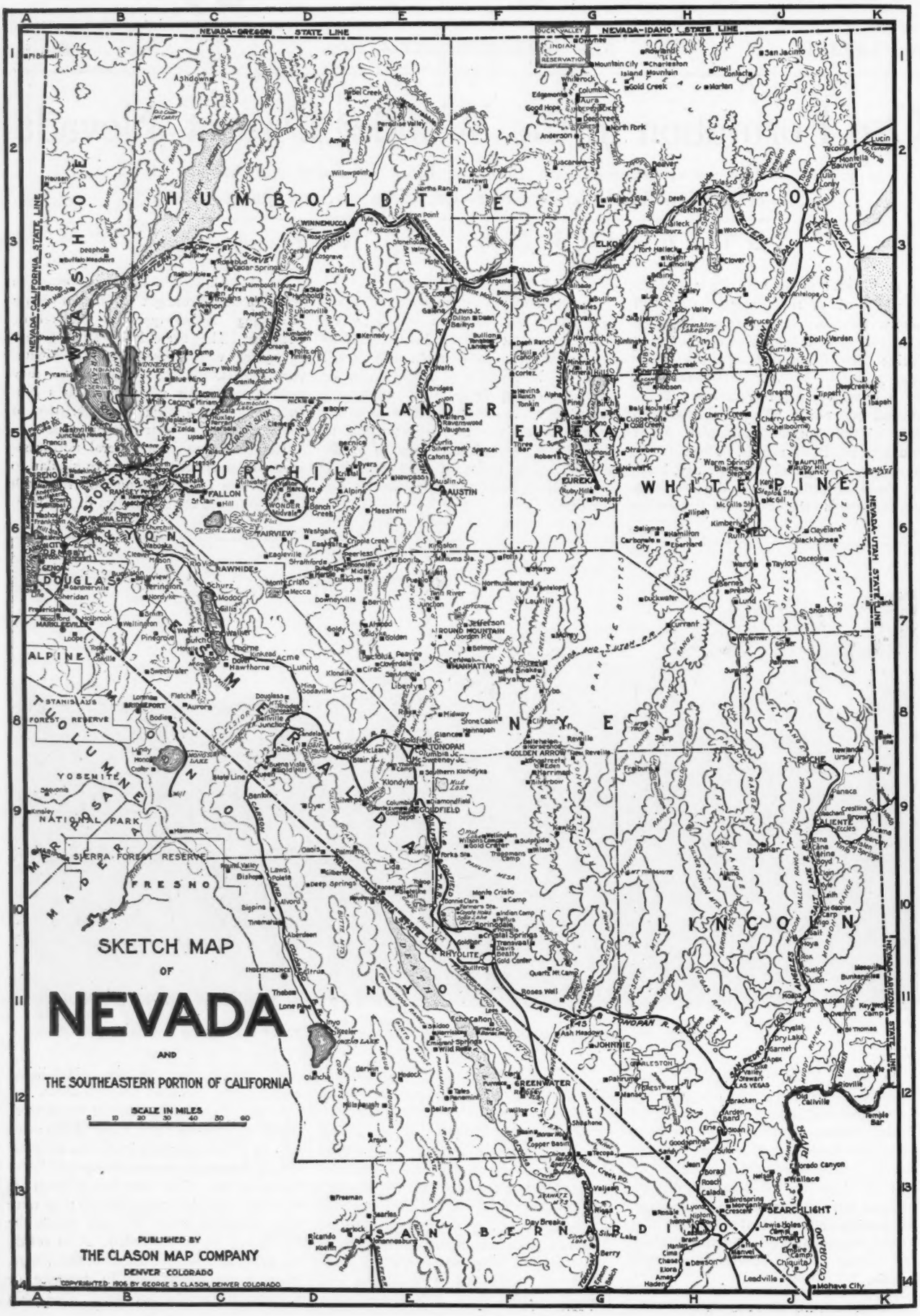
The mineralized territory of the Wonder district has an area of about six miles square. It is in the heart of a vent of very acidic eruptive rocks, with small areas of andesites, and larger areas of trachytes, cut by large dikes and masses of rhyolites. It seems that here, as in the Cripple Creek volcano, it is possible to find all the types of rocks passing by the most complete series of gradations into one another from the andesites to the rhyolites.

The andesites are rare and thoroughly altered. The trachytes are much more abundant and in a better state of conservation. The phenocrysts of orthoclase and of oligoclase are fairly fresh; the biotite has been altered into chlorite and epidote to a great extent. The ground-mass has been so charged with decomposition products and so colored by limonite, that it is difficult to recognize its constituent minerals. The rhyolites show phenocrysts of quartz and of orthoclase well formed. They show only occasionally carlsbad twinning. The ground-mass is made up of microscopic crystals of quartz displaying several types of the felsitic structure. They are either in small groups of crystals with the same optical orientation and extinguished together, or they form long needles radiating from a central point and having characteristics of some varieties of quartz porphyries.

The veins run in a general northeast-southwest direction. They are similar to those of the Tonopah mining district, both in the physical characteristics of the fractures and in the way the mineralizing waters have ascended through them.

In the Wonder district, the rocks were complexly fractured and many of the veins split up in two or more branches, as is the case, for example, in the Wasp and Stray Horse veins. The circulation channels were not made by open fissures; they were only fractured zones, through which the circulating waters ascended. As a result, the veins show all the stages in the change, from a fractured zone in trachyte or rhyolite, to a solid quartz vein. This main

WONDER, NEV., FAIRVIEW MOUNTAIN ABOVE FAIRVIEW CAMP IN THE DISTANCE


NEVADA-OREGON STATE LINE
NEVADA-IDAHO STATE LINE
NEVADA-CALIFORNIA STATE LINE
NEVADA-UTAH STATE LINE
NEVADA-ARIZONA STATE LINE
HUMBOLDT
LANDER
EUREKA
WHITE PINE
LINCOLN
CLARK
NYE
ESMERALDA
MINERAL
LYON
STOREY
WASHOE
CHURCHILL
DOUGLAS
ALPINE
MONO
INYO
TULARE
FRESNO
MARIPOSA
TUOLUMNE
STANISLAUS
YOSEMITE
NATIONAL PARK
SIERRA FOREST RESERVE
STANISLAUS FOREST RESERVE
SKETCH MAP
OF
NEVADA
AND
THE SOUTHEASTERN PORTION OF CALIFORNIA
SCALE IN MILES
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feature of the ore deposits of the Wonder district is shown in the accompanying illustrations of rock sections.

Vein Structure

In the extreme case, the vein consists simply of a zone of more or less altered trachyte or rhyolite, only a little richer in quartz than the same country rock, which forms the walls. The silver and gold minerals are closely associated, not only with the quartz, but also with the micas and the feldspars. In Fig. 1, ore from the Big Vulture vein, the stephanite is segregated in the ground mass in the same way as the micas and the feldspars. No orientation of any of the minerals, along the direction of the vein, can be seen.

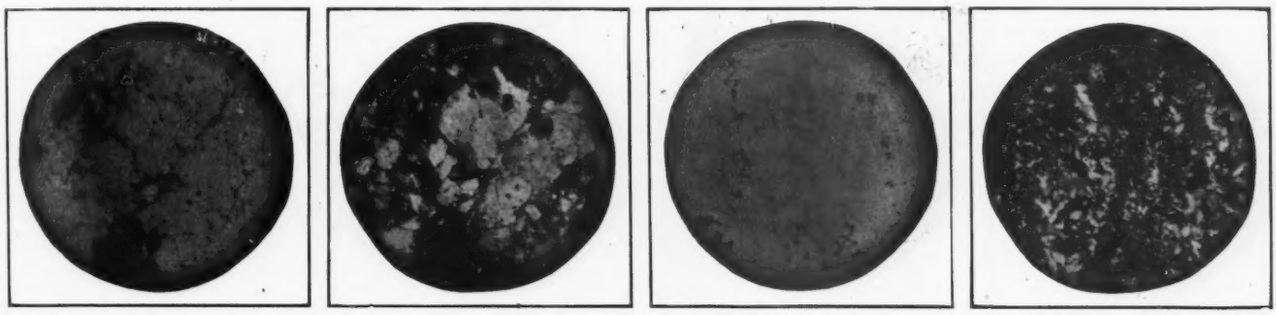
The mineralized zone, which forms the vein, is cut by fractures usually parallel, having the same dip and strike as the walls; the walls are stronger breaks only, of the same kind, which limit the zone of fracturing. In Fig. 2 ore from the Little Vulture and Queen No. 11 vein, the quartz begins to predominate over all the other minerals put together. But no lining of the silver minerals in a special direction can yet be recognized as is the case in Fig. 3, which shows a section of the Jack Pot vein. In this case, the micas have disappeared from the vein rock; the feldspars occur only sporadically, and the silver minerals have a more or less marked lining along the general trend of the vein. A very interesting feature of this microscopic section is that crystals of calcite are closely associated with the silver minerals; no other crystals of calcite have been found in any of 20 or more sections of rock examined. It shows conclusively that the mineralizing waters, which have deposited the Wonder ores were rich in carbonate of lime.

In the next step the metasomatic action of the mineralizing waters is plainly shown. The feldspars and the micas have disappeared, or they have been completely transformed into new products, like sericite, and others not well enough crystallized to be identified under the microscope. Nevertheless the banded structure, so characteristic of the open fissures filled by crustification cannot yet be found. Often the main wall fractures, being the larger ones, have been the main channels of circulation for the mineralizing waters, and the vein shows a zone of little altered trachyte between a hanging wall and a footwall streaks of quartz. Fig. 4 shows ore from the Queen vein on the footwall-quartz streak. In this case the silver minerals have crystallized last into the spaces left by the large crystals of quartz. Fig. 5 is from the Bald Eagle vein, showing large crystals of quartz, which have been fractured and filled by submicroscopic silver minerals. The interesting feature is that the quartz crystals have been broken after solidification, and that the ore lining shows the fractures passing without break from one quartz crystal into another.

With the last step, usually favored by a greater fracturing of the whole rock mass between the two walls, veinlets of quartz cross from one wall to the other, until they form a complete, and finally so close, a network, that the whole mass has been transformed into a solid quartz vein. In this last case the silver minerals instead of being scattered in a haphazard way, in the rock, partake of the general orientation of the quartz. They are found lined up along some main channel of deposition, as can be observed in the accompanying microphotographs, showing ore from the Wasp and from the Wonder veins.

The first shows ore from the Wasp vein, without analyzer; it shows in black the silver sulphides lined up in a well marked direction. That shown in the second is the same section with the analyzer on, showing the lining of large quartz crystals parallel to the silver sulphides. Nothing is seen except the silver sulphides and the quartz in large and small crystals; the micas and the feldspars have disappeared. The third microphotograph, from the Wonder vein, shows without the analyzer, the silver minerals well lined up. In the fourth the analyzer was employed. It shows the quartz in small crystals so well lined that they form a veinlet showing crustification, in the heart of which the sulphides are lined up.

The various conditions I have just described of a vein, simply formed by a set of parallel fissures across the country rock, are found in every one of the well



MICROPHOTOGRAPHS OF ORE FROM THE WASP AND WONDER VEINS

NEVADA WONDER SHAFT

JACK POT MINE

known veins of the Wonder district. In each of these veins, there are places more or less barren, which are characterized by the lowest stage of metasomatism and accompanying ore deposition. The transformation of the rock between the parallel sets of fissures increases more and more as an oreshoot is approached. In the oreshoot itself, the transformation has become complete.

The Camp

The district was discovered on March 15, 1906, by Thomas J. Stroud. He located the Lost claim, and during a second trip the Jack Pot group. On a third trip, he was followed by several parties of prospectors, who located the Nevada Wonder and the Queen groups. It was a month later that some exceedingly rich ore in shipping quantities was found. Then the rush began and the town of Wonder sprang up in a few weeks, with two banks, two newspapers, two hotels, an artificial ice plant, and, of course, many stores and a greater number of saloons.

The camp suffered from the business depression of last year, like all the other camps of Nevada; but is doing much better now and has perhaps 200 men at work on seven or eight properties, the Nevada Wonder, the Queen, the Jack Pot, and some others. The wages are those of the Tonopah scale, $4 and $4.50 per day.

Two railroad lines have been surveyed into the district; a branch line from Fallon, by way of Fairview, and one south from Winnemucca. A pipe line from Bench creek brings 150,000 gal. of water in 24 hours.

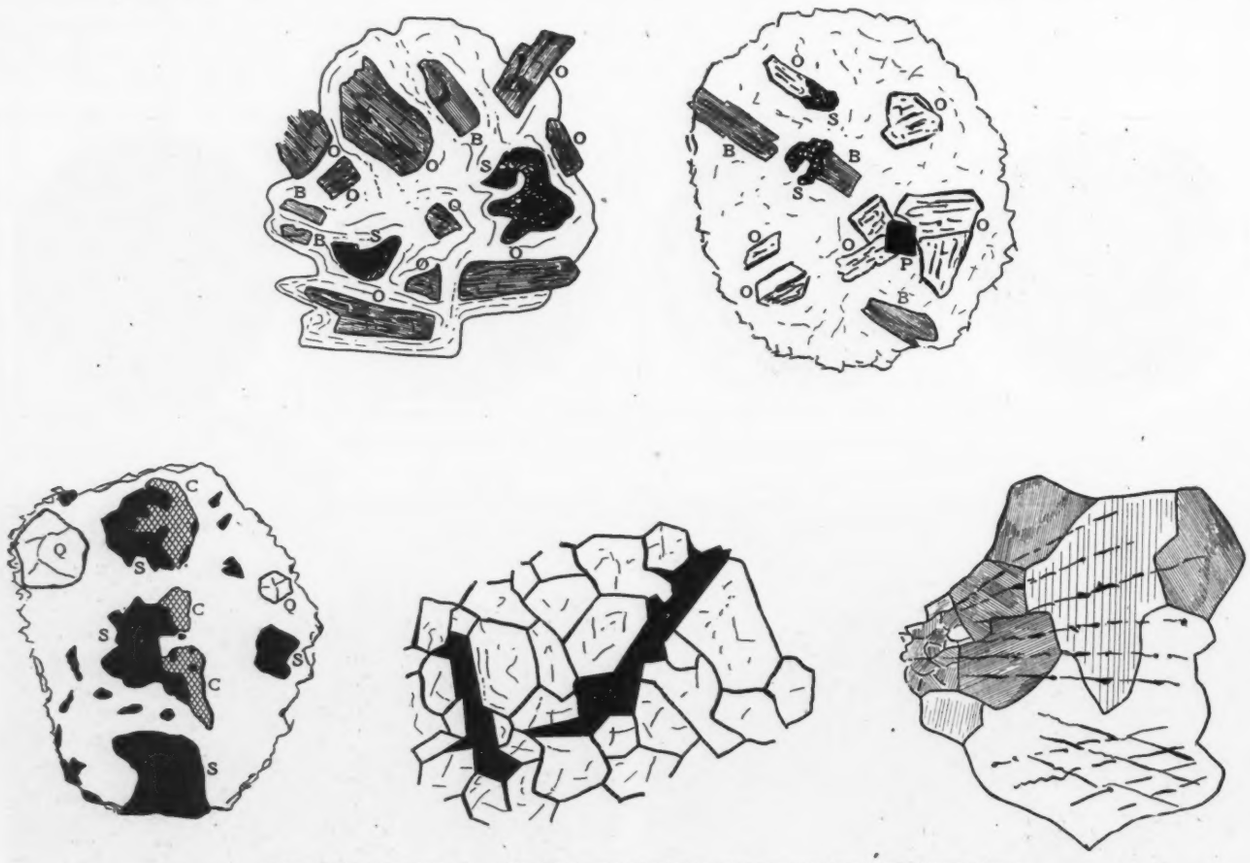
Coking of Coal with Fine Ore at Cerro De Pasco

A novel method of treating fine ore by smelting is in use at Cerro de Pasco, Peru. It consists in mixing the ore with coal and coking the coal. The coke being used in the smelting furnaces, the ore that it carries goes into the process in that way. The mixture consists of 25 per cent. by weight of fine ore and 75 per cent. of raw coal. The raw ore assays 22.36 per cent. silica, 20.90 iron, 9.75 copper, 5.08 alumina, 4.1 lead, 3.2 zinc and 24.58 sulphur. The raw coal analyzes 25.4 per cent. ash, 39.85 volatile matter and 34.75 fixed carbon. The coked product, after being coked in ordinary bee-hive ovens for 48 hours gave the following analysis: 8.2 per cent. iron, 3.11 copper, 4.41 sulphur, 33.9 ash, 2.01 volatile matter and 54.09 fixed carbon.

Magnesite in California

Special Correspondence

The new magnesite mines of the Tulare Mining Company at South Tule, in Tulare county, Cal., are showing up good quantities of ore, and if present indications are borne out, other calcining furnaces will be put in and preparations made to market the ore on a larger scale. The old mines at Porterville have some 1100 ft. of tunnels but the deposit is in such a condition that the cost of mining has been increased. Both mines really belong to the Willamette Paper and Pulp Company and it is probable that the supply for the paper mills will shortly be drawn entirely from the new deposits at South Tule. It is thought by the owners of these and other magnesite mines that if Congress imposes the duty asked for, they can ship to eastern points at a profit. The Fresno Magnesite Company has recently opened a mine in that county and has installed furnaces for furnishing calcined material to be made into articles for building purposes. The company is not selling to the paper mills, as the owners of these mills on this coast now own their own mines.



FIGS. 1, 2, 3, 4 AND 5. SKETCHES OF VARIOUS ORES FROM THE WONDER DISTRICT

In order from left to right, beginning at the top, the sketches represent: Ore from the Big Vulture vein, showing trachyte; the surface of the Little Vulture vein, showing the first stage of the mineralization; ore from the Jack Pot vein, showing calcite in groundmass of small quartz crystals; the Queen vein, showing ore filling interstices between large crystals of quartz; Bald Eagle, showing large quartz crystals broken and filled with microscopic lines of ore.

The Progress of Gold Mining in North Carolina

The Mines Which Were Large Producers Prior to the Civil War Are Again Attracting Attention; Many of Them Have Been Re-opened

BY EDWARD WEST LYON*

Gold was produced in the Southern Appalachian States before the Revolutionary War by the Cherokee Indians and others; the first gold minted by the United States Government in 1793 was mined in North Carolina. Estimates compiled from reports of the United States mints including the three mints established in the Southern States prior to 1848, at New Orleans, La., at Dahlonega, Ga., and at Charlotte, N. C., in 1837, and from State reports, show that the gold and silver production of the Southern States from 1799 to 1908 amounted to $49,900,000. Of this, 80 to 90 per cent. was gold, having a fineness varying from 750 to 980. North Carolina is credited with $23,000,000; Georgia with $18,000,000; the rest came from South Carolina, Virginia, Alabama, Tennessee and Maryland.

Gold was extensively coined between 1831 and 1857 by the Betchler family at Rutherfordton, N. C., until stopped by the Government. Their $1, $2.50 and $5 coins are now rare, as most of them were remelted with profit. During this time much gold was sold to country storekeepers; some of this was sent to the mint, but probably a considerable amount does not appear in the mint reports as coming from the Southern States.

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History

Gold nuggets were of frequent occurrence in early as well as later operations; the largest of these nuggets on record weighed 28 lb., and was found at the Reed mine, North Carolina, in 1803. Up to the middle of the last century most of the gold was produced from irregularly worked placers and similar detrital deposits, such as gravels in beds of streams, or on hillsides, surface gravel, and the gossan outcrops of the veins. To work these deposits required little skill and only a few cheap appliances, such as pans, sluice boxes, log rockers, arrastras and Chilean mills with "dolly tubs," these being usually run by horse whim or water power. Over limited areas some of these placer deposits yielded from $100 to $200 per rocker per day. Usually the gravel carried from 50c. to $2 per cubic yard.

Prospecting led to the discovery of the veins and the wide, lower-grade belts of silicious schists and slates that were the sources of the placer gold. The quartz veins, according to the report for 1856 of the State geologist of North Carolina, Mr. Emmons, were in places from 2 to 8 ft. wide, and contained or yielded at that time from $10 to $100 per ton; the schistose deposits were from 20 to 60 ft. wide, and yielded then from $2 to $6 per ton with open-cut mining and Chilean mills. At a few of the mines the quartz veins were worked to a depth varying from 100 to 500 feet.

The greatest mining activity occurred between the years 1829 and 1849; after that date, owing to the discovery of gold in California, there was a considerable exodus of Southern miners to the newer fields. Wooden stamp mills, as well as iron stamps with a few Cornish buddles for concentrating the auriferous and copper minerals in the sulphide ores, were in use when, in 1861, the Civil War stopped all mining operations. Before that time several North Carolina mines had been worked to a depth varying from 250 to 700 ft., and had produced from $200,000 to $2,500,000. Among these were the McCulloch (or Lindsay), the North State, the Phœnix, the Howie, the Hanover Hill, the Russell, the Jones, the Loftin (or Herring), the Rudisil, and the Gold Hill mines. Among the placer mines, the Portis had a recorded production of more than $1,000,000.

Mining was resumed by a new, inexperienced generation between the years 1870 and 1880. Since then there have been several spasmodic revivals, with intervening periods of depressions and irregular

CATAWBA MINE; A SCHISTOSE ORE DEPOSIT

SAWYER MINE, GRIZZLY AND WATER FEED

work. Nevertheless, the production has been considerable for the amount of development at the few locations worked.

In many cases where hydraulic mining, or where the modern stamp mill was used, the fineness of the gold and the slimes in the ore prevented a recovery of more than 40 to 60 per cent. But now an extraction of from 80 to 95 per cent. is possible from the soft ores by new pulverizing and washing methods, and from the hard ores by either the barrel chlorination, pyritic smelting, or the more recently perfected cyanide process. The cyanide process has recently been used successfully at the Iola mine, North Carolina, on free ores containing $15 to $20 gold per ton. The Modern pulverizer and concentrator washing process is used at the Catawba mines, North Carolina, on a schistose ore carrying 60c. per ton, and the barrel chlorination method at the Haile mine in South Carolina on pyrite ore carrying $2 to $4 per ton. Some of the ores can also be successfully smelted.

Principal Causes of Decreased Production

While the changing of the surface ore to refractory sulphide ore at greater depth, or the impoverishment of the orebodies at depth have caused some failures, many of these have been caused by poor management; by the adoption of experimental processes that in the end proved commercially unsuccessful; by the erection of mills before the orebody had been sufficiently developed; or by starting with a capital too small to provide for correcting initial mistakes.

These failures have given the Southern field a bad reputation among mining operators and investors, and many mining engineers, not having personally examined its history and record, its geological formations and ore deposits, hesitate on account of the before-mentioned reasons, and because of its being such an old and accessible field, to advise investment in, or even investigation of, mines in the South.

Consequently, the recent discoveries and the possibility of other discoveries, the new development proving the persistency of orebodies in these fissure and contact veins, and the increased profits obtainable from the application of new extraction methods to these ores, are being neglected.

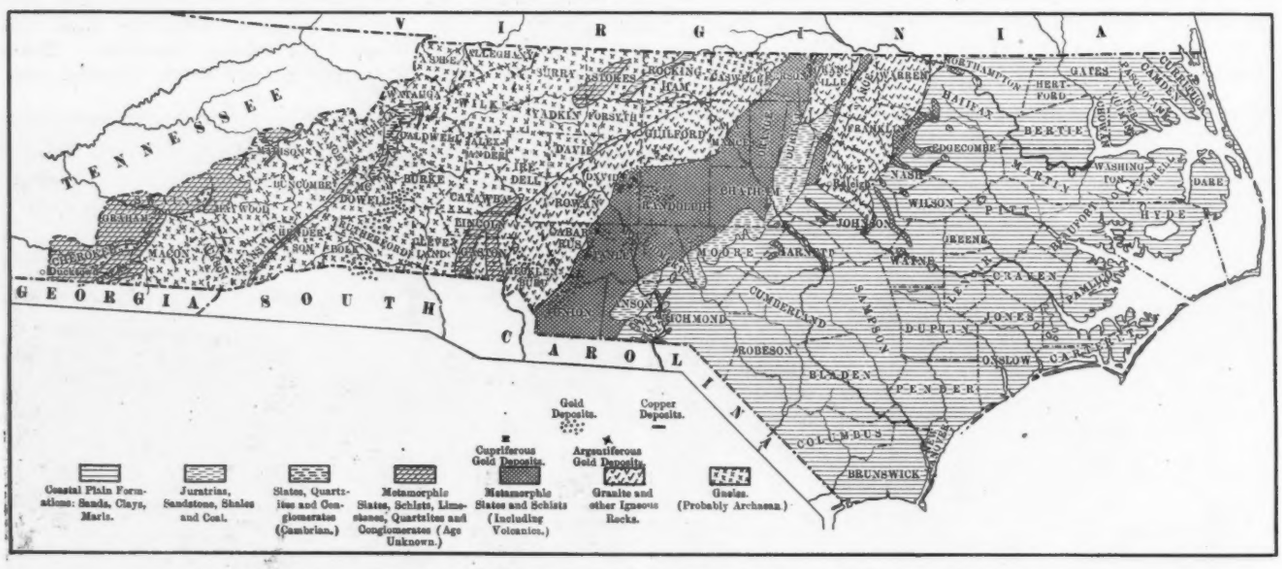
Geological Occurrence and Mineralogical Character of North Carolina Orebodies

The auriferous deposits of North Carolina are contained in the crystalline rocks, that, according to the geologists, cover one-half the State. The rocks include gneisses, metamorphic argillaceous, sericitic and chloritic schists, slates, silicious limestones, igneous plutonic rocks, such as granites, diorites, diabases, as well as ancient volcanics, such as rhyolite, quartz-porphyry and pyroclastic breccias. The limestones and some slates show sedimentary origin, but all are so metamorphosed that they may be included under the general term of crystalline rocks. They appear to be Archean, Algonkian and, in part, Paleozic in age; in geological literature the slates characteristic of southeastern Montgomery and Union counties have been called the "Monroe slates."

Structurally the ore deposits are of two principal types: the quartz-filled veins and the impregnated belts of schist and slate. The gold in the quartz veins occurs both free and in the iron, copper, and other sulphides. The veins differ greatly in mode of occurrence. Some are clean-cut fissures in the massive and the schistose rocks, intersecting the latter, both in dip and strike, at a well defined angle; others occur along contacts between the granites or diorites, and the schists or slates, while still other veins are composed of a system of larger and smaller lenticular bodies, generally conformable to the schistosity of the rocks, but sometimes intersecting the schists, usually at small angles. These veins vary in width from 1 to 8 feet.

The impregnation of free gold and fine-grained auriferous sulphides in the country schists and slates are sometimes accompanied by small intercalated quartz lenses. These schists are sometimes hundreds of feet in width, but usually only a portion of their width carries sufficient mineral to pay for mining. It is these large schistose orebodies that form the low-grade deposits of North Carolina and the other Southern States; from them considerable gold has been produced.

In both the veins and the schists, the ore generally occurs in chimneys and shoots. The general strike of the schistosity is north 20 to 55 deg. east, and the dip varies from 55 to 85 deg. toward the northwest. Most of the veins have a northeast-southwest strike and dip to the northwest. The rocks of the gold belt are much decomposed. The veins are often oxidized to a depth of 100 ft. and in some instances, as at the Iola and Cagle mines in North Carolina, the ore in the vein is oxidized or carries free gold to a depth of several hundred feet, while the inclosing wall rocks carry sulphides.



GEOLOGICAL MAP OF NORTH CAROLINA, BASED ON MAP MADE BY NORTH CAROLINA GEOLOGICAL SURVEY

Gold Belts of North Carolina

The North Carolina field may be divided geologically and geographically into three main belts: the Eastern Carolina belt, the Carolina belt and the South Mountain belt. The Eastern Carolina belt forms a small area in Halifax, Warren, Nash and Franklin counties; it is bounded by the coastal plain and the Louisburg granite. The country rock is diorite, in places changed by shearing into a chloritic schist; other intrusions, some of diabase, occur. The quartz veins vary in width

from a few inches to several feet. They occur in the schists and also along the contact of slates and granite. In places, the surface soil near the veins carries sufficient fragmentary quartz to make it minable. In this area there are some rich placers.

The Carolina belt is subdivided into the Carolina Slate belt and the Carolina Igneous belt. The Carolina Slate belt, which is composed of argillaceous and sericitic slates, crystalline schists, rhyolites, quartz-porphyries, andesite and pyroclastic breccias, is from 8 to 50 miles wide and extends in a southwesterly direction across the Central Piedmont section of the State. It is called by Emmons, one of the former State geologists, "the Taconic," and by Kerr, a successor of Emmons, "the Huronian" belt. In this belt occur fissure and contact veins containing auriferous quartz. Such veins have been worked at Gold Hill, Hoover Hill and other mines. There are also in this belt wide low-grade impregnations of the schists and slate, in which the gold occurs both free and in pyrite as at the old Russell, Jones, Lafflin, Empire, Pine Hill and Haile mines. At the Parrish mine the gold ore is an impregnation of actinolite and tremolite.

The Carolina Igneous belt is west of the Carolina Slate belt. It is from 15 to 30 miles wide, and extends southwesterly across the State through Guilford, Rowan, Mecklenburg and other counties. The rocks in it are granites, diorities, gabbros and diabases cut by later, granitic and diabasic dikes. Schistose or gneissic structure is developed at places. In this belt the gold-bearing quartz occurs in fissure veins, several feet wide; the gold occurs free and in the sulphides. Often, these gold ores are cupriferous, sometimes carrying from 3 to 20 per cent. copper. The old Fentress and Gardner Hill mines, the McCulloch, North State, Lindsay, Fisher Hill, Phœnix, Reed and Rudisil mines are in this belt.

The South Mountain Belt

The South Mountain belt is subdivided into the King's Mountain belt, East Blue Ridge belt and the West Blue Ridge belt. The King's Mountain belt adjoins the Igneous belt on the west and passes through Gaston, Lincoln, Catawba, Yadkin and other counties. The country rocks are crystalline schists and gneisses in which lenticular bodies of silicious magnesian limestone and beds of quartzite occur occasionally. Pegmatite dikes are found in the King's Mountain district in Gaston and Cleveland counties; some of these dikes are tin-bearing. In this belt the ore occurs not only in fissure veins, but also as impregnations of the silicious, magnesian-limestone intercalations in the mica schist. The old King's Mountain mine (Old Catawba), which produced several hundred thousand dollars, is an example of the latter form of deposit. The schists or gneisses at the Catawba (Old Shuford) mine in Catawba county are profitably worked to a width of more than 100 ft. and to a depth of 90 feet.

The East Blue Ridge belt has an area of 250 to 300 square miles, and is principally on the eastern side of the Blue Ridge mountains in Burke, McDowell, Rutherford and Caldwell counties. The crystalline rocks are for the most part micaceous and hornblendic gneisses and schists that often contain garnet and sometimes zircon and monazite. Pegmatite and also granite and diabase dikes occur. This complex is cut by a system of parallel quartz fissures, containing free gold and auriferous sulphides. These fissures vary in width from 1 in. to 4 ft., and many fissures are only 1 to 3 in. wide. These veins strike north 60 to 70 deg. east. Some of them have produced high-grade gold ore. Near the veins some of the saprolites are auriferous. The principal mining ground is composed of the placers, the gravel deposits in the stream beds, gravel in hillsides and gulches, and the saprolites.

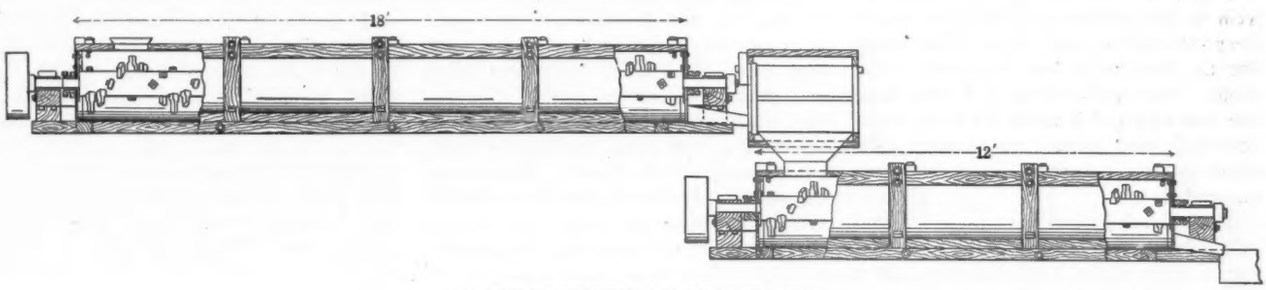
A large amount of gold has been produced by sluicing and hydraulicking in the Brindletown district in Burke and Rutherford counties. Where washing or sluicing is now being done, the gravel carries from 20c. to several dollars per cubic yard.

In the West Blue Ridge belt the ore deposits are scattered. The country rocks are mica and hornblende schists; these are cut by granitic dikes. At Boylestown, Henderson county, limestone underlies the schists. The principal mines of this belt are in Swain, Jackson, Macon, Clay and Cherokee counties, where placer-mining operations are carried on. The country rock is supposed to be mainly Ocoee in age.

The Iola Mining District

The Iola mining district is a comparatively new district near Candor, Montgomery county, N. C. The Iola, the principal mine in the district, has produced over $300,000 in gold since its discovery in 1901. This mine was first worked with Chilean mills, then a 10-stamp, and later a 20-stamp mill and a 40-ton cyanide plant were erected to treat the ore. The Iola Mining Company owns about 65 acres covering approximately 2000 ft. along this vein. Recently a 40-stamp mill equipped with concentrating tables has been completed; the cyanide plant is now being moved and re-erected with additional tank capacity below the new mill. The production for April, when the mill was operating at only about three-fourths its capacity, is stated to be $9000. The country rock is a greenstone of slaty character, probably a sheared andesite. A dike, resembling basalt, and running at right angles to the country, occurs not far from the adjoining Golconda mine.

The surface soil near the veins is sandy and shallow. Although the ore outcrops in one place only, the vein can be traced by iron-stained quartz float along its strike, which is approximately north 40 deg. east. The vein varies from 2 to 6 ft., and averages 2½ to 3 ft. in width; it dips 45 to 50 deg. toward the northwest. The only outcrop of the vein occurs at the discovery shaft. At the surface the ore is a hard, milky quartz, showing visible gold, but a few feet deeper the vein matter became soft and changed to a slaty quartzite ore carrying some lime spar between distinctively slaty walls. Quartz did not appear in the vein again above a depth of 130 ft. In other shafts pay-ore was not encountered until a depth of 30 to 50 ft. was reached. A few faults of small displacement have been encountered underground, but as yet no cross-vein or dikes. Down to 327 ft., the present depth of mining, the gold is fairly evenly distributed in the vein; nearly all the gold is in a free state, the vein carrying only a small amount of sulphides. A good deal of sulphide impregnates the wall rocks; this is unusual at Southern ore deposits. The gold, although fine, is usually granular. Pay-ore has been developed along the vein for 650 ft. by four shafts but drill



MODERN PULVERIZER AND CONCENTRATOR

holes have extended the length of the known pay-ore 150 ft. farther southwest.

Persistency of the Ore

The persistence of the ore is shown at the main or No. 1 vertical shaft, which cuts the vein at a depth of 265 ft. and follows it 72 ft. deeper. Crosscuts have been run from this shaft at the 150- and 200-ft. levels; drifts have been driven on the vein and some stoping has been done. On the 255- and 327-ft. levels north and south from this shaft, the highest grade of ore in the mine, much of it showing visible gold, has been developed. Samples from these levels assay $35 to $45 per ton. Recently, some of this ore has been mined and milled, but on this level a considerable reserve of ore remains. No. 2, a vertical shaft, 333 ft. southwest of No. 1, cuts the vein at 115 ft. and follows it 50 ft. deeper; drifts have been driven from it in both directions on the 116-ft. level. The No. 3 shaft, 150 ft. deep and 214 ft. east of No. 1 shaft, was sunk to work a body of high-grade ore developed in the discovery incline that has since caved; most of this ore has already been mined. No. 4, a new incline shaft sunk on the vein to the southwest of No. 2, is 180 ft. deep; it is in a pinch of the vein, which for the last 20 ft. has been only 15 in. wide. This shaft, which is located near the new mill and is to be the main working shaft, was started to be sunk to a depth of 600 ft.; work on it has been suspended.

These developments have proved a considerable reserve of ore. While the driving of drifts to the southwest may add to this reserve more rapidly than it is required to supply the mill, still, either the new No. 4 combination shaft or the No. 1 shaft should be sunk several hundred feet so as to develop the vein at greater depth, for the Iola vein warrants such development.

Sullivan and Rand drills are used in mining the harder ore. The Mecklenburg Iron Works 8-in. Cornish pump at No. 1 shaft does all the pumping. A 3-in. pipe line, 1½ miles long, supplies water for milling. At surface, and also underground, electricity generated at the mine is used for lighting. The different engines at surface are run by steam.

The ore is delivered to mill from No. 1 and No. 3 shafts in cars by cable and from other opening by barrows. It is fed by hand to the 40 stamps, that weigh 700 lb. and crush through 50-mesh screens. After passing over amalgamating plates, 16 ft. long, and shaking tables, the pulp which carries $4 to $6 gold per ton goes in flumes to the cyanide plant. The stamp duty is a little over one ton per stamp in 24 hours.

At the new 60-ton cyanide plant the usual method of agitation and decantation will be used in treating the slime and the sand will be leached in small tanks. Compressed air will be used in the agitators to loosen the slime before throwing into gear the agitation clutches. The sand from the separators will be partially dried on a dump before loaded into the leaching tanks, lime being added to the sand as the tank fills.

Such were the plans a few weeks ago, but since then a receiver has been appointed to take charge of the Iola Mining Company, mainly on account of mismanagement previous to April, 1907.

Montgomery and Golconda Mines

The Montgomery mine adjoins the Iola on the northeast and contains the extension of the Iola vein in that direction. The main shaft at the property is 235 ft. deep; on that level considerable work has been done on two veins, one having the general character and grade of ore as the Iola vein. The property is equipped with a 10-stamp mill and cyanide plant. This mine is not being worked at present, but the water is being kept down. A new shaft, several hundred feet from the present openings, was recently started.

The Golconda mine adjoins the Montgomery; its workings are on a vein, 2 to 6 ft. wide, east of and parallel to the vein in the Iola and Montgomery properties. It is opened by an incline shaft 150 ft. deep from which levels have been driven at depths of 50, 100 and 150 ft. Some of the ore exposed assays $15 to $20 per ton, but, as the mine was full of water, examination of the deeper workings was impossible. The ore differs from the Iola ore in its brownish color and quartzy character; it also contains considerable sulphide. The dike, outcropping in its vicinity, possibly has played a part in the genesis of this vein. The mine and its 10-stamp mill are idle.

Neither the northeasterly or southwesterly extension of the Iola district has been prospected much, but identical iron-stained float and gold-bearing gossan or gravel is known to exist at several locations. Recently a new development company has been buying property on the northeastern extension of the vein.

By drill holes, new coal measures have been found in brown sandstone and shales within 15 to 20 miles of the Iola district. This find may develop into a source of cheaper fuel for that part of the State.

Catawba Mine

One of the low-grade schistose mines is the Catawba, situated four miles from Catawba, N. C. This mine produced considerable gold by crude washing and milling methods, but when hydraulic mining was tried, the undertaking proved a failure. Its massive decomposed schistose and gneissic formation, intersected at places by small quartz seams, is opened and the entire width mined by an open cut several hundred feet long, 100 to 150 ft. wide, and 50 to 90 ft. deep. The ore is free milling, and its average gold content is 60c. per ton.

At present the ore from this mine is profitably treated with a stated extraction of 80 to 90 per cent. by the new Modern pulverizer and concentrator. This machine was adapted to treat this class of ore, and was installed at the mine by the mine superintendent, A. J. Overton, about three years ago. The cost of mining and treatment is said to be from 15 to 25c. per ton. One set of pulverizers and washers, shown in an accompanying cut, was installed at first, but additions have been made until four sets, with sluice boxes, are now in operation. From 160 to 200 tons are washed in 10 hours; it is claimed that 300 tons per 10-hour day have been mined and washed. The property is not operated at night.

The Modern pulverizer and concentrator is an improvement on the old Snodgrass washer, which in the newer machine has been adapted to the treatment of schistose and placer formations. This device is a combined disintegrator, pulverizer, concentrator, scourer and washer; it saves a high percentage of the coarse and finer as well as the flour gold. The machine consists of two iron concaves, the first 18 ft. and the second 12 ft. long, with revolving shafts, extending through each washer. The shafts make from 150 to 250 r.p.m., and to them are bolted a series of spirally arranged iron or steel blades. The machines discharge, near the bottom of the lower ends, through 1-in. and ¼-in. revolving screens, respectively. Any lumps or uncrushed rocks go to a belt conveyer; the pulp that passes through the disintegrator goes to sluice boxes.

The feed ends of the machines are set 8 in. and 4 in. higher, respectively, than the discharge end; the sand and fine gravel accumulates, and the free gold is recovered where it settles near the upper end of the disintegrators. Most of the gold is caught in the 4-in. space below the concaves, and from 60 to 70 per cent. of gold is caught in the first machine. In the weekly cleaning-up, the concentrators are discharged through an opening in the bottom. Quicksilver is used only in the riffles and in the crude clean-up boxes.

Method of Mining

The ore is delivered from the open cut by cable in one-ton wooden ore cars and in large scoops to the grizzly on the side hill above the mill. One man sledges the oversize from this grizzly. At present the ore from the grizzly is flumed with 3-in. and 5-in. water lines under a head of 35 ft., to the washers about 200 ft. distant, but the company will soon move the washing plant several hundred feet below the present site so that the ore can be delivered by gravity from the mine to the washers, thus avoiding maintenance and cost of their present hoisting plant and delivery method.

The mill and hoist are operated by a 200-h.p. boiler and a 70-h.p. engine. A

pipe-line ¾ mile long supplies water from a dam, which also catches the water draining from the tailings. From the dam the water is pumped to the grizzley. The necessary equipment for the four-washer plant, including buildings, power, pumping outfit and mining equipment, probably cost, erected, between $20,000 and $25,000.

The capacity of one pair of washers is rated at from 40 to 100 tons in 10 hours. One pair requires 75 gal. of water per minute, and from 15 to 25 h.p. to operate it. The price per set of two machines, including shafting, is $1750 f.o.b. Chattanooga, Tenn. The erection and equipment of an ordinary one-set plant, including power, buildings, water, etc., costs approximately $5000. By using crushers to break the ore before it goes to the washers, the harder types of schistose ores may be cheaply and efficiently treated with this washer.

Working tests with one set of machines at both the Sawyer and the Parker mines showed a good recovery in the machines, but large losses occurred through careless or crude clean-ups of the gold-bearing sands and concentrates.

The use of Pierce separators and amalgamators below the washers, when maximum tonnage is desired, and the use of a modern clean-up pan are recommended. The clean-up pan will prevent the loss in the clean-ups of the gold saved in the machines.

The Catawba Mining Company owns and controls several hundred acres along the northeastern extension of their ore deposit, so that the company is considering an addition to their plant.

Silver, Copper and Tellurium Ores

Silver ore is found at few places in North Carolina. At Silver valley the lead carbonate and the galena associated with zinc blende are argentiferous. The old Silver Hill mine, at that place, was worked to a depth of 735 ft. by the Confederate Government, in order to obtain lead for bullets. Native silver has been found in this mine.

Tellurium has been found in the ores of the Belle mine, Montgomery county, and also at a new location in Halifax county in the Eastern Carolina belt.

The 1906 State report shows that the gold production of North Carolina comes from 34 counties; in the State there were, not including minor operations, nine placer mines and 15 deep or vein mines operating; the yield per ton of ore milled was $7.70. The number of mines under development or operation is, therefore, less than during the last few years.

The copper produced from North Carolina ores comes mainly from gray copper and bornite ores in Person county and from chalcopyrite ores in Rowan county. From 1900 to 1907, there was produced 3,763,916 lb. of copper, valued at $658,519. The production for 1906 was 582,209 lb., valued at $135,829. This is an increase in value of 81 per cent. over the 1905 production, due partly to the higher prices of copper prevailing during that year. Incomplete figures tabulated by United States Geological Survey from reports of the production and value of gold, silver and copper from 18 counties in North Carolina gotten directly from the principal mines, shows a total production for 1907 of $212,909 against $288,781 for the year 1906.

	1907.	1906.	Decrease.
3,976.08 oz. gold.....	$ 82,193	$122,008	$ 39,815
21,666 oz. silver.....	14,300	30,944	16,644
582,082 lb. copper.....	116,416	135,829	19,413[1]
	$212,909	$288,781	$ 75,872

[1] Decrease in pounds copper produced was 127 lb.

In spite of this decreased production, at several new properties prospecting and developing have been started during the present year. Among these are the Morehead property, containing a silver-lead-zinc ore, in Davidson county, the Gray gold property in Guilford, the Portis gold mine and other properties in Catawba and Rutherford counties.

American Crude Oils

The accompanying table, taken from the *Petroleum Review*, Aug. 15, 1908, which states that the table is only an approximation, gives a good idea of the composition of the crude oil from the different oilfields in the United States.

APPROXIMATE COMPOSITION OF THE CRUDE OILS OF THE UNITED STATES

Products.	Appalachian. %	Lima-Indiana. %	Mid-Cont. %	Gulf. %	California. %	Corsicana. %	[Colorado. %
Naphthas—gasolene, benzine, etc.	12	11½	11	3	6	7	3½
Illuminating oil	67	43	41	15	18	50	35
Lubricating oils (including grease)	12½	15	—	6	1½	—	3
Gas oil	4	25	25	45	72	—	—
Fuel oil (including acid oil, asphaltum oil and asphalt)			20	28		40	55
Paraffin wax	2	2	—	—	—	—	—
Total	97½	96½	97	97	97½	97	96½

Trial of the Karns Tunneling Machine

(Special Correspondence)

Recently I made a trip to Magnolia, nine miles from Boulder and 39 miles from Denver, to witness a trial of a newly installed rock borer, known as the Karns rotary tunneling machine. The trial was made at a mine owned by one of the gentlemen who financed the drill company.

The cutting head of the drill is 6 ft. in diameter; the power is furnished by a Rand Imperial compressor, giving about 1500 cu.ft. of air per minute. The entire machine weighs about 10 tons; the head and shaft, or in other words, the reciprocating parts, weighing 5½ tons, and the carriage the rest.

The water, which was thrown against the breast, and which carried the "muck" back of the machine, was furnished from a reservoir by a No. 9 Cameron pump, through a 4-in. pipe, reduced to 2 in. at the discharge.

We arrived at the mine at 1 p.m., and the machine was at once started up, with the result that in 90 min. of actual drilling time it bored a hole 6 ft. in diameter 64¼ in. into solid granite; the measurements were carefully made by disinterested engineers in the party. The entire time occupied in drilling the hole was 110 min., but the screw was moved up twice, taking 10 min. each time. The machine can cut from 4 to 5 ft. without being advanced, but in this trial, it was put forward twice in the 5 ft. 4¼ in.

There were, as far as I could see, no parts of the machine that were weak or liable to breakage; the moils or cutting points, of course, became dull, as any drill would, but these can be easily replaced with sharpened ones. The water and a sort of endless-chain rake in connection with the device brings the "muck" back of the machine, but the conveying for long distances to the mouth of the tunnel of the two tons of chippings per foot of advance has yet to be reckoned with. Automatic conveyers are being perfected, and doubtless this want will soon be filled.

At any rate, the cutting power of the machine was amply demonstrated — further I cannot say, for its durability under a long period of work has yet to be proved.

Gold and Silver in New Zealand

The Mines Department reports the exports of gold from New Zealand for the full year at 508,210 oz. bullion in 1907, and 506,447 oz. in 1908; a decrease of 1763 oz. The bullion reported in 1908 was equal to $9,758,197, or 472,095 oz. fine gold.

Silver exports for the year were 1,562,603 oz. in 1907, and 1,731,366 oz. in 1908; an increase of 168,763 oz. This silver is chiefly from the gold mines of the Ohinemuri district.

Rusty gold concentrates from blanket tables are amalgamated (*Journ.*, Met., Chem. and Min. Soc. of South Africa, Nov., 1908) by treating them for four hours with nitric acid in a revolving amalgamation barrel. After that treatment, upon adding mercury, the gold amalgamates readily.

Prevention of Accidents in Metal Mines

Accidents Due to Carelessness Are Preventable. It Should Be the Duty of the Superintendent to See That the Miners Are Not Careless

BY CLAUDE T. RICE

Falls of ground, reckless handling of explosives, and carelessness at and in the shaft are the three principal causes of accidents in metal mines. Carelessness in the shaft causes many accidents; explosives cause more; and falling slabs of rock the most. Many of these accidents can be prevented by study and foresight; yet the discussion of this subject of mine accidents is shunned by mining engineers—possibly because they hate to acknowledge how many accidents are due to poor management.

The one book treating of mine accidents and the articles which occasionally have appeared deal mainly with accidents at coal mines, while the little that has been written on accidents at metal mines consists mainly of statistics regarding the frequency of different classes of accidents, and rarely contains any comments that would aid in preventing their recurrence. A few years ago one of the Western mining periodicals, the *Mining Reporter*, published each week a list of the mine accidents that had occurred during the preceding week together with the causes as far as ascertained; but that section of the paper seems to have reached too tender a spot in the anatomy of mining men for it finally was discontinued. The motive of that column was good, for it brought home each week to the men in charge of mines this question of mine accidents; yet it did not arouse any discussion.

Mine accidents do not decrease in number by being ignored, so it seems to me to be high time that some of the time and the space devoted to wild hypotheses in regard to ore formation were given to the humanitarian side of mining and that the study of the causes of mine accidents and of ways of preventing recurrence of similar accidents were undertaken.

During the first two and a half years after I left college, I worked as a miner at many of the important mines in the Western States. While mucking, running machines, single-jacking and timbering, I had a chance to observe mine workings in their every-day condition, as well as in the holiday attire that a stope dons when the superintendent or manager obligingly tells the foreman that he will probably go underground at a certain time. In this article I shall state some observations that I have made upon the causes of different mine accidents, and in some instances I shall try to point out ways of avoiding the recurrence of such accidents. While discussing accidents in mines I shall also discuss mine fires.

Accidents from Overwinding

Few accidents, at least in the United States, result from breaking of the hoisting rope or from overwinding; still I once had the experience of being hoisted within 10 ft. of the sheaves by a drunken engineer. As a rule the hoisting engineers are the most reliable men in a mining camp, and no one should infer from this that drunkenness is common among hoisting engineers. Still it emphasizes the fact that all classes of men must be watched. To guard against this class of accidents it is well to have some device for preventing overwinding, such as those that shut off the power at a certain point.

While speaking of drunkenness it might be well to say that drunkenness is a contributory cause in many accidents, for many times miners go to work in a partially intoxicated condition. By hiding among his fellows, often the miner conceals this condition, but as soon as he goes underground the hot, vitiated air soon increases the stupor. An intoxicated or partly intoxicated miner does not work, and he is a danger to himself and others. In order to guard against a drunken miner's getting underground, all miners, before going on shift, should have to report to the timekeeper in a well-lighted room where for some distance the miners must file past him. Any miner coming to work drunk or even partially intoxicated should be fired. The miners should be double-checked, i.e., they should be checked both when they go on and come off shift. This double checking insures that all the men are out of the mine at the end of the shift. Besides, it shows that all the miners stay underground the full time. At some mines where on night shift the shift boss makes only one round after dinner the miners have been known to sneak home before the end of the shift.

Accidents in Shafts

The few accidents that happen in the shaft during hoisting are mainly due to the following three causes: Riding on the same deck with timbers; riding on the cage with tools, such as picks, drills, etc., in the hand; and riding in empty, or on top of loaded cars.

Timbers should be securely lashed when lowered in the shaft, and no one should be allowed to ride on the deck with them, even when there is plenty of room, for the timbers often slip in a very mysterious manner on the wet iron of the cage floor. No one should be allowed to carry tools on the cage, for if the hoisting engineer stops the engine suddenly the men will probably drop the tools with the possibility of their catching between the cage and the timbers. Loose drills should never be lashed on the cage, but a special box, mounted on a low truck with a broad axle base, should be provided in which to lower the steel. If the steel or tools, such as picks, are placed in a box of that kind, the truck is locked on the cage, the tops of the drills are securely lashed, and the tool "nipper" is made to ride on the other deck, no accident will happen when lowering the steel or tools.

Gates on the Cages

Riding on the cage in a car, whether loaded or empty, is extremely dangerous, and many are the deaths that have been caused by it. Fortunately most companies in the United States strictly forbid riding on cars in the shaft, yet at some otherwise well managed mines this is allowed. The danger arises from the fact that the miners are apt to forget to latch the catch that holds the car. The jar of the cage throws the car off, and the men are caught between the cage, the car and the timbers.

Hoisting of the shifts without gates on the cage is another source of accident in shafts. At mines where more than 30 men work on a shift it should be made a criminal offense to hoist or lower the shifts without gates on the cage, for generally the cages at which times are so crowded that if gates are not used men are apt to be pushed off, while being hoisted. The gates do not cost much, and when they are used the men can be hoisted and lowered in less time. The gates should be of the swinging type and not of the folding latticework or pantograph type, for the latter are apt to belly out under pressure and so cause an accident. Overhead bars low enough so that the men can hold onto them easily should be provided on all cages used for hoisting men. These can be arranged so as to swing out of the way when the handling of the men is finished.

At large mines the men often crowd badly at the stations when they are being loaded onto the cages at the end of the shift. This is dangerous; the foreman or the superintendent should see to it that it does not occur. The station tenders, unless backed up by a special order from the foreman, are generally unable to cope with the difficulty. Still, if the station tenders skip the levels where the crowd-

ing occurs, and hoist first from the other levels, the crowding generally ceases.

In hoisting with buckets many accidents result. These happen more frequently from the non-use than from the use of crossheads. The accidents with crossheads are due to their "hanging up" in the shaft and then falling upon the men in the bucket. If the hight of the crosshead is two-thirds of its width there will be little danger of its catching between the guides; if one of the several recently designed crossheads is used, such accidents cannot happen, for the bucket is fastened to the crossheads is used, such accidents cannot is not used for sinking, the crosshead should be securely fastened to the hoisting rope as near as possible to the bucket, and if the bucket is designed to dump by rotating in its bale, the bale should be fastened securely to the crosshead. When sinking with a bucket not provided with an improved locking crosshead, a clip should be securely fastened to the hoisting rope far enough above the bucket so that the crosshead could not strike even a 7-ft. man on the rim of the bucket. A little platform on the top of the crosshead, providing room for four men, will do away with the need of riding in the bucket except when shifts are being changed. If at that time the bucket is lashed to the crosshead, such accidents will be prevented. Many deep shafts have been sunk by means of a bucket without using crosshead and guides, but I think that the use of a crosshead and guides should be made compulsory unless the hoisting is done with a windlass. In case the ground stands so well that timbering is not required, rope guides can be used.

Accidents with Explosives

In considering accidents due to explosives I will not consider those that result from carelessness in thawing dynamite, for generally the person who blows himself up in that way is one of those who knows it all, and no advice would have aided him. Fortunately, as knowledge regarding dynamite becomes more common, accidents due to carelessness in thawing dynamite are rapidly decreasing in number.

At several mines in the West there have been serious accidents arising from the storage of dynamite in large quantities underground. The correct place for the storage of dynamite is in a short drift driven at some distance from the mine entrance and closed by a thick door covered with a piece of turn-sheet. Several accidents have resulted at mines where the dynamite was stored in a wooden house. In some instances no one had been near the building for some time, and the only explanation suggested was that a stray bullet from some hunter's rifle had exploded the dynamite. In case that owing to flat topography, a drift cannot be driven conveniently, the powder-house should be made of brick or stone and should have iron-protected doors.

In no case should more than two days' supply of dynamite be taken into the mine, and only one day's supply should be kept on each level. The dynamite on the different levels should be stored in a dry part of the mine (some unused drift is often convenient), and if possible this place should be electric-lighted. No miner should be allowed to carry a lighted candle into the powder room, if it is lighted by electricity, and in no case should anyone be allowed to take a pipe (in fact all smoking should be forbidden in a mine) or capped fuse into the powder room. The caps and fuse should be kept at least 100 ft. away, and the place for the fuse should not be too warm, since some fuse deteriorates rapidly in a warm temperature and, owing to swelling, becomes difficult to cap. The place where the detonators are kept should be tightly floored so that if any are spilled they can be picked up easily; and none will then be lost under foot, possibly later to be exploded, disabling someone.

The carelessness of miners in handling explosives is notorious, but an occasional watching of the men at powder time together with an occasional firing of a man caught handling dynamite carelessly will soon result in a greater respect for dynamite.

At many large mines several powder-monkeys are employed. In the morning they keep busy capping fuse, thawing dynamite, and packing it into sacks for the different levels. In the afternoon the powder-monkeys go through the stopes distributing the dynamite and fuse to the men, keeping record of the amount of dynamite and the number of fuse given to each miner. In several mines this has resulted in a large decrease in the bill for explosives. Anyway the method is safer than letting the miners get their own dynamite for explosives are handled mainly by experienced men in whom the company has confidence.

Accidents Caused by Missed Holes

Missed holes are the cause of most of the accidents with explosives. Misfires may occur from many causes, chief among them being improper loading and improper placing of the holes. When holes are drilled too closely together cut-off holes result; if the cap and fuse are torn out of the charge, a missed hole results. More frequently the misfire is caused by improper loading. One would naturally think that miners must know how to load a hole properly, but many do not. In cold stopes a frequent cause of misfire is the placing of the primer in the hole with the fuse end ahead. This necessitates so sharp a bend in the fuse, that frequently the powder train in the fuse is broken; and a misfire results. Among other mistakes in loading is the improper use of tamping. For these reasons the foreman and superintendent should investigate the manner of loading used by a miner guilty of frequent missed holes.

All miners should count their holes as they explode, and should report any misfires to the shift-boss. The shift-boss should immediately record these on a blank slip that is left for the boss on the other shift. Before he goes home, the shift-boss should post a copy of this on a bulletin board so placed that the miners when they go on shift cannot help but see it.

When "short a hole" frequently the miners assumed that an unusually loud report was a "double," and do not report a missed hole. Any miner can count, and after spitting the holes he can go to some safe place where he can hear his holes go off; consequently any remissness in reporting holes is carelessness pure and simple. To insure that, in cases of doubt, the miners will report a missed hole, any miner who fails to report a misfire should himself be fired.

Most missed holes occur in development work, and it is just in those places that it is sometimes difficult for a miner to find the missed hole. Consequently all miners working in drifts, crosscuts, raises, winzes and shafts should be made to show by means of arrows on a diagram the position, direction and relative length of all holes blasted. This enables the other shift to find quickly a missed hole. Besides, in case of failure to report the misfire, the miners on the next shift, after looking at the diagram of the holes blasted, would probably recognize the presence of a missed hole. In stopes a miner can generally tell from the shape of the breast whether or not there has been a missed hole; indeed a good miner before he begins work generally tries to figure out how much and where the other shift drilled.

Government Inspection of Explosives Needed

While discussing explosives and their use, it is well to draw attention to the fact that, while in other countries explosives, detonators and fuse are carefully tested, in the United States any old thing can be used. For instance there is no regularity in the rate of the burning of fuse. In one mine one kind of fuse with a certain rate of burning is used; in another a different kind with a different rate. Miners change frequently from mine to mine; at each change they are apt to use a new kind of fuse. They ask other miners about the speed of the fuse, and cut the fuse accordingly. They may cut it too short, and then they must scamper to get to safety. In Western Australia fuse must burn not faster than 80 sec. per yd. nor slower than 100 sec. per yd. At first this limitation seemed impracticable to some, but according to the Report for 1907 of the Department of Mines, Western Australia, page 221, out of 311 samples of fuse tested in 1907 only 28 did not comply

with the requirements of the State law; 17 samples went over and 11 under the prescribed limits. In regard to detonators, E. A. Mann, chief inspector of explosives, Western Australia, in the July, 1908, issue of the *Monthly Journal* of the Chamber of Mines of Western Australia states that frequently in his tests he has found that the nominal strength of detonators is not rigidly adhered to by manufacturers. He recommends, therefore, the use of only such detonators as experience has shown to be reliable. His statements should be borne in mind for possibly some misfires may be due to poor grade of detonator. It seems to be high time that some action were taken by the United States Government in regard to explosives, detonators and fuse. Anyway the superintendent should have each purchase of fuse tested for speed and regularity of burning before the shipment is accepted. At present too little attention is given to explosives in the United States, especially by mining men.

Accidents in Stopes

Men frequently fall down chutes and manways, or are injured by rocks or tools falling down manways. Such accidents in stopes and drifts are needless as they can easily be prevented. In the first place all chutes and manways should start from an offset on the level below, and should "hole" into an offset on the level above. Then timbers can be hoisted or lowered to the stope without blocking the drift, drills slipping out of the chain while being hoisted will land in the offset without tearing up the rails, and rocks falling down the manway will not strike some passing carman on the head or dirty up the track later possibly causing an upset. When the raise and chute "hole" by the side of the track, they should be railed in so that no one can walk into them. A raise should never be driven so as to "hole" into the level under a track, for if it is, sooner or later someone will fall down the raise and be killed.

The tops of all chutes and manways, as well as the bottom of all manways, should be covered with trap doors so that, when the stope is not being worked, the doors can be closed and the air caused to go up through those stopes that are being worked. Moreover, such trap doors are better than the railings for preventing persons or objects from falling down raises or chutes, and as has been shown, greatly aid in properly ventilating the stopes. The timbers in all manways that are in use should be cleaned from time to time in order to guard against accidents from falling rocks when several men are using the manway at the same time.

In the stopes, accidents from falling down chutes or manways can be prevented by means of grizzlies and railings in the case of square-set, and by means of grizzlies and trap doors in the case of stull chutes. The grizzlies also prevent large "round heads" from being thrown into the chute.

Poisonous Gases at Metal Mines

While poisonous gases are more frequently in coal mines, still at a few metal mines there has been trouble with flows of gas from solid rock. This is unusual, but one or two cases have been reported from Colorado and, as I remember, but I may be mistaken, one man was killed by the gas. This gas contained principally carbon dioxide. The death of this man indicates the chances that men will sometimes take in bad air. No man should be allowed to stay long in a place where a candle will not burn. In fact he should not stay at all in such a place; not because it is very dangerous to health if the oxygen is just insufficient to nourish a candle flame, but because after that point is reached the person has no way of telling how much farther the oxygen has been depleted. Still I know of mines in the West where many Italians are working in electric-lighted drifts and stopes, electric-lighted because the air is too poor to support combustion. Such practice is criminal, unless it is absolutely necessary.

Such workings are generally in caved sulphide orebodies, and the depletion of the oxygen is due mainly to the rapid oxidation of the sulphur in the heated particles of finely pulverized sulphide minerals. The heat in these places is due partly to the oxidation and partly to the grinding and crushing of the caved ore. The necessary oxygen can be supplied by opening wide the valve on the air pipe or by using a blower. Generally the compressor is already too small for its work, or what is almost the same thing the shift boss thinks so; consequently the poor miner works in bad air.

Whenever any such places are being worked in the mine, special care should be taken in hoisting from those levels, for these men are very apt to faint when they suddenly encounter the cool, fresh air in the upper part of the shaft. Men who have been working long in a stuffy raise or in a stope in which the powder smoke hangs badly, are also apt to faint while being hoisted. It is especially because of these facts that the gates ought to be used on the cages. Yet I know of one case in which, even when gates were used, a miner upon reaching the cold air fainted, his head protruded beyond the cage, and he was crushed to death. Therefore, owing to that possibility, whenever a miner has a bad powder headache or has been working in bad air, he should be ordered to report the fact to the station tender, who should load him as near the center of the deck as possible so that if he faints his companions can hold him.

In tapping old shaft workings the workmen should be prepared to meet with quantities of carbon dioxide, and, in case the workings contain much timber and have been under water for some time, the superintendent should not be surprised if, on connecting with those workings, he finds inflammable gases.

Mine Fires

The subject of gas leads us to that of fire, for most of the carbon dioxide giving trouble at metal mines is due to the burning of timbers. Fires are apt to occur at any time at mines where much timber is used, and even where little timber is used the shaft timbers are liable to catch fire if the shaft is dry. Although fires at metal mines have caused the death of many miners, still, comparatively speaking, few metal miners die in mine fires. Nevertheless, owing to the fact that at most mines little provision is made for fighting or preventing fires I will treat of the subject.

In dry shafts in order to prevent fire a little trickle of water should be allowed to fall on the top sets and flow slowly down the other timbers. Since it is only necessary to keep the timbers moist, the flow of water should not be enough to make the shaft wet. This moisture also prolongs the life of the timbers, for it diminishes the growth of bacteria; especially is this the case in warm, upcast shafts where the bacteria and fungi increase rapidly.

Many lives have been lost at metal mines in trying to rescue men from burning workings. This rescue work can be carried on with little danger if one or two helmets for fighting fires are kept at the mine. Some of the later invented helmets, in which the wearer carries the supply of oxygen along with him, are to be preferred as they are less cumbersome than the older type supplied with air from a hose, yet the homemade Anaconda helmet recently described in the Journal by Robert N. Bell is sufficiently good at mines where compressed air is handy. At least two helmets should be kept at mines where much timber is used underground. At a number of mines thousands of dollars, to say nothing of lives, might have been saved if fire-fighting helmets had been at hand in the early stages of the fire.

The compressed-air pipes at all shaft mines should be connected to the surface water-supply so that by opening a valve the air-line can be converted into a water-line. If then several nozzles, so constructed that they will screw into the couplings on the air-drill hose, are kept in the storehouse, the mine is equipped with a good fire-fighting system.

Fireproof Door near Portal of All Adits

Fires are especially dangerous at mines worked through adits, for generally at such mines there is a strong ventilating current sucking up through the stopes. At mines, where the blacksmith shop and

other buildings are connected with the adit by snow sheds, in case the surface buildings catch fire the smoke is apt to be sucked through the adit up into the stopes. Frequently this smoke suffocates some of the miners before they can escape through the upper workings.

Such accidents happen almost every summer, and yet they are easily prevented by a few precautions. In the first stretch of untimbered ground in the adit an air-tight, self-closing door should be hung, which is arranged so that it can be closed from a distance. The door should be held open by a wire or rope running on pulleys to the entrance of the mine. Outside of the mine, in case that a wire is used, a rope must be attached to the wire. The end of the rope should be fastened in the blacksmith shop or at some other place where men are constantly present. Then in case of fire someone can unfasten the rope and let the mine door close. This rope should be carried along near the top of the snow shed so that, in case the shed catches fire and no one unfastens the rope, it will burn, releasing the door. The door being air tight and in an untimbered portion of the mine prevents the sucking of the smoke into the mine workings, no matter how violent the fire may be outside. This door should be frequently tested so as to see that it works easily, and in winter special care should be taken that ice does not form so as to prevent the door from closing air-tight.

On each level of all mines in the drifts leading to the shaft stations similar air-tight doors should be placed. In case the drifts are timbered, a concrete bulkhead with an iron door should be built. By closing these doors the stopes of each level can be shut off from the shaft in case of fire.

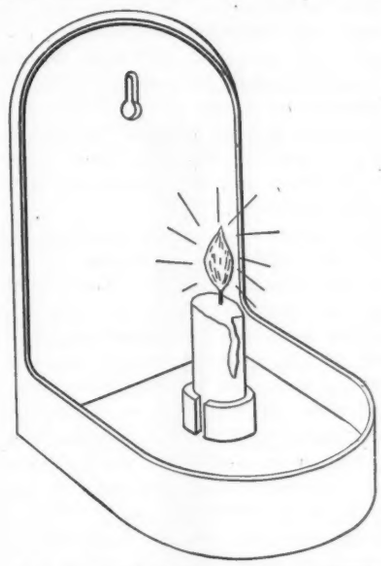
Mine fires may start from the caving of timbered stopes in orebodies rich in sulphur, but most start from the carelessness of the miners. The fire at the Homestake mine, Lead, S. D., started, it is said, from a blast that set fire to some old timbers in a portion of the mine that was being reopened. When such work is being done, not only should the miner be required to go back to the face after blasting, but also the shift-boss or, if there is a "fire bug,"[1] the "fire bug" should be specially ordered to visit all such workings. Moreover, when reopening old stopes or drifts in which many old timbers are found, a water pipe should always be carried along as the drift advances.

In square-set mines most fires start in stopes from candle snuffs left on the timbers. The explosion of the holes generally extinguishes these lights, but in some cases it does not. Leaving a lighted candle in a mine is good cause for discharging a miner. If much timber is used, a "fire bug" should go through all the workings, unless sconces are used. Sconces are far better than any "fire bug."

[1]In Western mining camps the name "fire bug" is applied to the man who goes through the stopes after the shift leaves the mine to see that no fire, such as a burning candle snuff, etc., is left in the mine.

The Sconce

The sconce is an old Cornish device which is used in the square-set stopes of the Copper Queen Consolidated Mining Company's mines at Bisbee, Ariz., to hold the candles placed at the chutes and at other places in the stopes. It is shown in an accompanying illustration. The sconce is made of cast iron, and in order to resist the rough usage that it undergoes it should be made especially strong. The sconce used at Bisbee is a one-piece casting consisting of a back and a bottom portion meeting at right angles. The back, which keeps the flame from blowing against the timbers, has a hole in it for hanging the sconce from a nail. The lower round part of this hole is large



SCONCE USED AT COPPER QUEEN MINES, BISBEE, ARIZONA

enough to go over the head of even a 60-penny nail, while the slotted upper portion is wide enough to slip along the body of a nail of this size, but not wide enough for the head of a 40-penny nail to slip through it; this prevents the sconce from being knocked off the nail on which it is hung. The hole should be placed at least an inch from the rim for this part of the sconce is the weakest. The bottom piece has a rim ½ in. high extending all around it so as to catch the melting grease or paraffin from the burning candle. In the center of the bottom and about 2 in. in front of the back is the candle holder. This is a ring 1 in. high having the diameter of the candle used at the mine; it is slotted so that the miner can easily gouge out, with his candlestick, any butt of a candle remaining in the holding ring.

If this ring holder is kept cleaned out so that the candle is securely held, and the grease is not allowed to accumulate on the bottom, there is no possibility of the burning candle setting fire to the timbers, for it cannot fall out of the sconce. As soon as the miners have been trained so that they will not burn candles in, or on, anything other than their candlesticks, or these sconces, no "fire bug" is required to go through the stopes to guard against fire. Sconces have been used in the Copper Queen mines at Bisbee for years without, I think, a single fire. This speaks well of the sconce, and other mining companies using the square-set method should adopt it. A few fire extinguishers are also very useful about the surface plants at mines.

Accidents Caused by Falling Rocks

Finally we come to the main cause of accidents at metal mines, and for that matter at coal mines; that is, falling ground. Accidents from falling ground are of two classes—those due to carelessness, and those that are due to unforeseeable circumstances. In the latter class belong those accidents in which stopes suddenly cave, or large blocks of ground—so large that on testing they sound as if they are solid—fall. These accidents are due to unsuspected slips that cut across the vein. Geological maps, on which the principal movement planes are indicated, aid in preventing such accidents.

The other, the careless class of accidents—those accidents that the mine inspector and the coroner's jury generally report as unavoidable and due to no contributory negligence on the part of the company—claims the most victims. All accidents due to the falling of slabs of rock weighing less than a ton are due to carelessness; most people say due to the carelessness of the miner; certainly, but also due in most cases, I claim, to the contributory negligence of the company. In Mexico the men in charge of the mines realize that they must watch the miners so as to safeguard them (besides the Mexican government investigates the methods used at mines where accidents are too frequent); but in the United States, mining men assume that the miners know enough to safeguard themselves. Such an assumption, I assert, is the cause of half the accidents at metal mines.

Men accustomed to danger become careless. It is not because the miner in the United States has insufficient brains that he requires watching, but it is because in time almost every miner develops a contempt for small dangers such as the falling of a small rock from the roof. He becomes lazy, and rather than take a little time to make the place safer he begins work after picking down the worst of the roof.

You can depend upon the machinemen's picking down the back immediately surrounding the place where they are going to set up the drill, but, since picking down the back takes time and is hard work, they generally skim over the rest of the roof near the face. In case the mucker is a

fellow countryman the machinemen will be more careful, but if he is of some other nationality the miners will soon call out that the back is all right. During the last few years most of the mucking in the West has been and for that matter is still done by those nationalities that the Western miners call "dagoes"—not necessarily Italians, but also Hungarians, Poles, Finns, Austrians, Montenegrins, Servians, etc. These fellows are generally stronger in the muscles than in the head, so they begin to muck whenever they are told by the miners (in the main, Irishmen, Cornishmen or their American-born descendants) that it is safe to do so.

When the shift-boss comes along he first looks at the muck pile that the other shift has left for him, then he notices what kind of a set-up his miners are going to have, and finally he looks to see if any timbers are needed. Then he hurries along probably with some admonition to the muckers to "sail in" and get him out some "muck." The foreman comes along soon after, and his trip is even faster than that of the shift-boss, for he must cover the whole mine and must spend time keeping up his reports and letting miners "rustle" him for a job. Neither the shift-boss nor the foreman pays especial attention to the condition of the roof.

The mucker mucks on, finally a slab, jarred loose by the blows of the machine drill, falls and hits him. He is hurt, possibly killed. Whose fault? The coroner's jury will say that it was due to his own carelessness, but I say that it was due to his own ignorance, the laziness of the miner, and the want of care on the part of the company's agents, the shift-boss and the foreman.

The majority of the readers of this will probably say that I exaggerate, but I can judge only from my own observations for I know of no others who have contributed theirs. During the two and a half years that I worked as a miner, and it was mostly at the better mines of the West, I can remember (and of this I am almost positive) only two occasions when I saw or heard of any miner's being "called down" for not picking down the back. Both those times it was myself who was "called down." Once when I was mucking in the Camp Bird mine, Colorado, the shift-boss "jacked me up" because I, greenhorn that I was, was shoveling under some slabby ground. He ordered me to take the ground down, but to the miner whose duty it was to keep the stope safe he said not a word. Another time in another mine I was deservedly "called down" for beginning to drill before I had picked the face of the drift clean of loose rock.

Events Leading up to an Accident

I have timbered in several places where my partner and I would not stand a stick of timber before we had picked down the back; but the muckers had been working under the ground for some time. They did not know better; we did, or at least my partner did. I well remember picking down over a ton of rock from a roof under which muckers had been working for two shifts, and even then my partner and I would not stand the timbers while the air drill was running. These occurrences were in well-known mines of the West that were in other respects very well managed; such occurrences were not unusual.

The cycle of events leading up to accidents from falling ground is a long one, but almost universally it is somewhat as I will describe it. The manager asks the superintendent for tonnage; the superintendent demands ore from the foreman; the foreman tells the shift-boss to get out the rock; and the poor shift-boss goes through the stopes yelling to the machinemen and the muckers, "Rock! Rock! Rock!" Consequently the shift-boss looks upon the timbermen as a nuisance who block the tracks and the stations with their timbers, thus decreasing the tonnage; and the stope—well, as long as it does not cave, the shift-boss inwardly says: "The stope be dammed." His first anxiety is to see the pile of rock that the other shift has left for him; his main activity is watching the chutes from the different stopes and the tally-boards at the different stations.

The machinemen notice this, and they see that neither the shift-boss nor the foreman watches the roof. Consequently the time that they spend in thoroughly picking down the back is not considered, and, as they probably have a family depending upon them and therefore desire to hold their jobs, they have to work harder the remainder of the shift in order to get in their round of holes and make a "showing." The miners begin to slight the back of the stope; nothing is said. They get bolder, they skim over the back and only pick down where they are going to set up the machine, and still nothing is said by the bosses. An occasional small rock falls on a shoveler's back. The poor foreigner frightened runs back, then swears in broken English at the miners. Unfortunately that is all that he does; if he only hammered the miners over the head with a shovel, he might save his own head later. As it is, a few punches at the roof with the pinch bar suffices to reassure the shoveler; then the miners begin drilling again. Everything goes lovely in this manner for days until finally a rock falls from the roof and someone is hurt or killed. Then for a few weeks the miners are more careful, but soon they, the shift-boss, and the foreman are back again in the old lazy, careless ways.

Conclusion

Consequently I say that, unless the superintendent sees that the foreman sees that the shift-bosses see that the miners pick down the back, the miners will only skim over the roof and will not pick it down properly. Until the miners are made to pick down the roof properly, falling ground will continue to be the cause of most mining accidents.

I hope that possibly these notes may induce some companies to begin the study of this problem of preventing mine accidents, and that they may serve to make life less hazardous for the miner—especially for those partners who patiently endured me while I was trying to learn to mine. In conclusion I ask those readers who are in charge of mines to take a trip through the stopes so as to observe in their own mines the condition of the roof at the different faces, the position of the raises, the amount of rock on the timbers in raises, winzes and shafts; then I hope that they also will discuss this question of accidents. The number of accidents at mines can only be diminished by studying their causes and by improvizing some system to prevent their recurrence. This can best be accomplished by each telling the other what he has learned about mine accidents, and by suggesting to one another ways of preventing similar occurrences. Finally—let me whisper it for no one will pay attention to the suggestion if it is shouted—possibly, if the miners learn that the men in charge of mines are taking a vital interest in their (the miners') safety underground, labor troubles may be less frequent than in the past.

Drawback on Zinc Shavings

Special Correspondence

In accord with a decision rendered by the division of customs in the Treasury Department, a drawback of the amount of duties levied, less 1 per cent., will be allowed in future upon the exportation of zinc shavings manufactured from imported zinc in sheets. The drawback entry is required to show the total quantity of zinc shavings exported, the quantity of imported sheet zinc used in the manufacture, the quantities of the different kinds of waste and the market value thereof, together with the value of the imported zinc at the factory. It must also show that the shavings were manufactured of the material and in the manner set forth in the sworn statement of the exporter. In liquidation the quantity of the imported material which may be taken as the basis for the allowance of the drawback may equal that claimed in the entry, after official verification of exported quantities, provided it shall not exceed the net weight of the exported shavings with the proper quantity added there to compensate for worthless waste. In estimating this waste the value of the scrap is to be duly considered.

All drifts where much tramming is done should be well lighted.

Mining Methods for Maximum Recovery of Coal

Early Systems of Mining the George's Creek Coal Secured About 50 Per Cent. of the Seam, Present Methods Insure Recovery of 95 Per Cent.

BY H. V. HESSE*

There is no phase of human endeavor in which man's extravagance has been so forcibly exemplified as in the mining industry of the United States.

The conservation of our natural resources is a subject which is focusing the attention of the American people. Much has been written and many addresses have been delivered on this subject of grave import. It has been discussed by men of all degrees from the chief ruler of the land to the humblest citizen, and the scientific world is busy devising ways and means to prevent the extravagant methods which have held forth for many years in unrestrained recklessness. The "get-rich-quick" spirit has resulted in the devastation of our forests, the depletion of a large percentage of our fabulous deposits of minerals and left us face to face with the greatest problems that have been encountered.

The tremendous development in the United States during the past generation fairly staggers the mind. In the mad chase of the "almighty dollar," the great absorbing idea has been the desire for quick results. No sooner had the investment been made than immediate results and big returns were expected. The investor became impatient and chafed at the least delay, thus causing methods to be employed in extracting our minerals, which were not economic, but, on the contrary, extravagant, and created conditions which have proved dangerous to life and property.

Four Important Factors

There are four factors, any one of which is sufficient to cause a serious loss in the percentage of coal recovered and an increase in cost of production, reducing the ultimate earnings of the property:

1. Insufficient or incompetent engineering. Until very recently the engineer was regarded by many coal operators as a luxury and an unnecessary refinement. This unreasonable conservatism or prejudice still exists to some extent; however, the rapid depletion of properties which have been regarded for many years as practically inexhaustable, is quickly bringing the operator to a full realization of the necessity for the careful planning and scientific projection of the mine by a competent and sufficient engineering force.

2. Incompetent management: There are some mine managers or superintendents who produce better results from a poorly designed mine than others can obtain from a first-class plant. Many managers have been entirely satisfied with a low cost sheet, neglecting the conditions both inside and outside the mine, which ultimately resulted in an abnormal increase in cost of production or the abandonment of valuable acreages of coal, in order to maintain lower costs. This

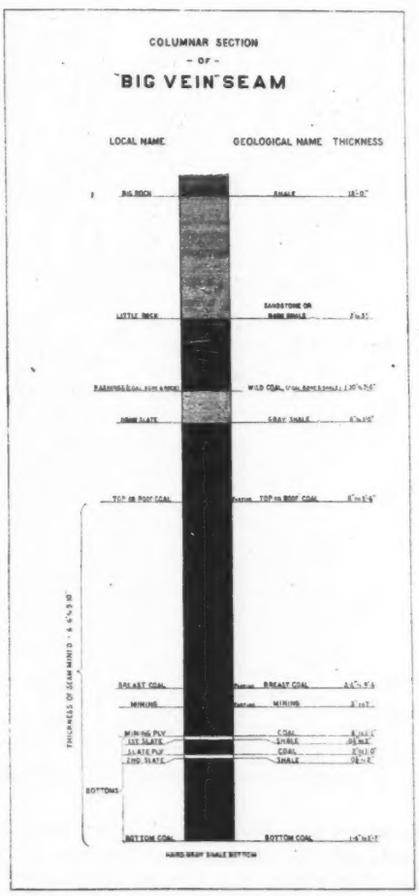


FIG. 1. A SECTION OF SEAM FROM FLOOR TO MASSIVE ROCK ABOVE

method was often repeated until finally after millions of tons of coal had been buried, which could have been recovered by a prudent and careful manager without materially affecting his cost of production, those in charge have been brought to a sudden realization of an unnecessarily high cost and a diminished tonnage, resulting in loss of prestige and position for the manager, and thousands of dollars to the owners. Such an official is surely a shining example of the ancient aphorism, "as thou sowest, so shalt thou reap."

The necessity for a mine manager to be familiar with not only the outside, but also the inside condition of his property, either personally or through tried and competent assistants, cannot be underestimated. Unless he is thoroughly familiar with these facts, how can he know if the individual mine superintendent or mine foreman is giving him the desired results of low cost with maximum recovery and the best conditions for a continuation of that low cost?

3. Unfavorable labor conditions: The employment of unskilled miners renders it impossible to obtain a good recovery. Strikes and shutdowns have often interfered with the application of economic methods of extracting coal. Labor unions sometimes insist on conditions which, while operating for the convenience of the miner, increase the expense or induce an unnecessary loss of coal to the operator. For instance, in some districts of the country, the track must be laid in the center of the room with the "gob" on either side. Few or none of the pillars are recovered and many acres have been lost through "squeezes" and "creeps" because of wide rooms and small pillars. Nor is interference with the methods of mining the only manner in which the unions sometimes operate against the maximum recovery of coal. There have been men discharged for incompetency, who were reinstated by the management on demand of the union. And it is thus, that discipline, which is such an important factor in the economic administration of a mine with a view to the best ultimate results, is defeated.

4. The impatience of owners for quick returns on their investments: The deleterious effect on the economic development of a property by the demand of the investor for an immediate profit, can hardly be overestimated. Many a rich and valuable property has been irreparably damaged by the insistence of owners for immediate and large profits before its proposed economic development has been fairly launched. This impatience and greed has oftentimes resulted in the changing of slow, but good plans of development for bad ones, and the poor results thus obtained were further accentuated in later years by the demand for big tonnage, thereby causing the loss of millions of tons of coal and thousands of dollars to the investors. Indeed, this demand for large tonnage from

*Mining engineer, Frostburg, Md.

a poorly developed mine has been the greatest factor in encouraging careless methods of recovering coal both from rooms and pillars, and it is no exaggeration to state that the abandoning of many acres of good coal, which could have been recovered by more thorough and known methods, can be traced directly to this cause.

The Property Should First Be Carefully Explored

In the development of a coal property after a reconnaissance has been made, a reasonably thorough knowledge of the seams to be exploited should be attained before the installation of a permanent plant. This can be done by diamond drilling, numerous crop openings, or a pair of headings driven through the property at some favorable location. The coal from such headings could be disposed of locally, shipped from a temporary dump, or, in the absence of railroad facilities, stocked until disposition could be arranged later.

While this is going on, a competent surveying party should be engaged in accurately locating the boundaries, principal streams, etc. If the property is large and the topography favorable, a triangulation survey can be made and all boundary lines carefully tied in. The mining rights in the original grants should be thoroughly studied in this connection and complete records made. Too much stress cannot be laid on the necessity for an accurate survey. Much money has been wasted in unnecessary litigation due to encroachments and violation of mining rights. The main haulways of more than one mine have been driven far into another man's property, because of inaccurate maps and surveys. Accurate surveys of the surface features of a property have a direct and important bearing on the inside workings in other ways, such as showing the relative position of two or more mines in the same property, the proper location of bore holes or shafts for drainage and ventilation purposes and the determination of thickness and nature of strata overlying the seams under development. Armed thus with a general knowledge of mining rights, thickness, continuity and quality of coal, dip of the measures, probable roof and floor conditions and the thickness and nature of overlying strata, the struggle for maximum recovery is well begun.

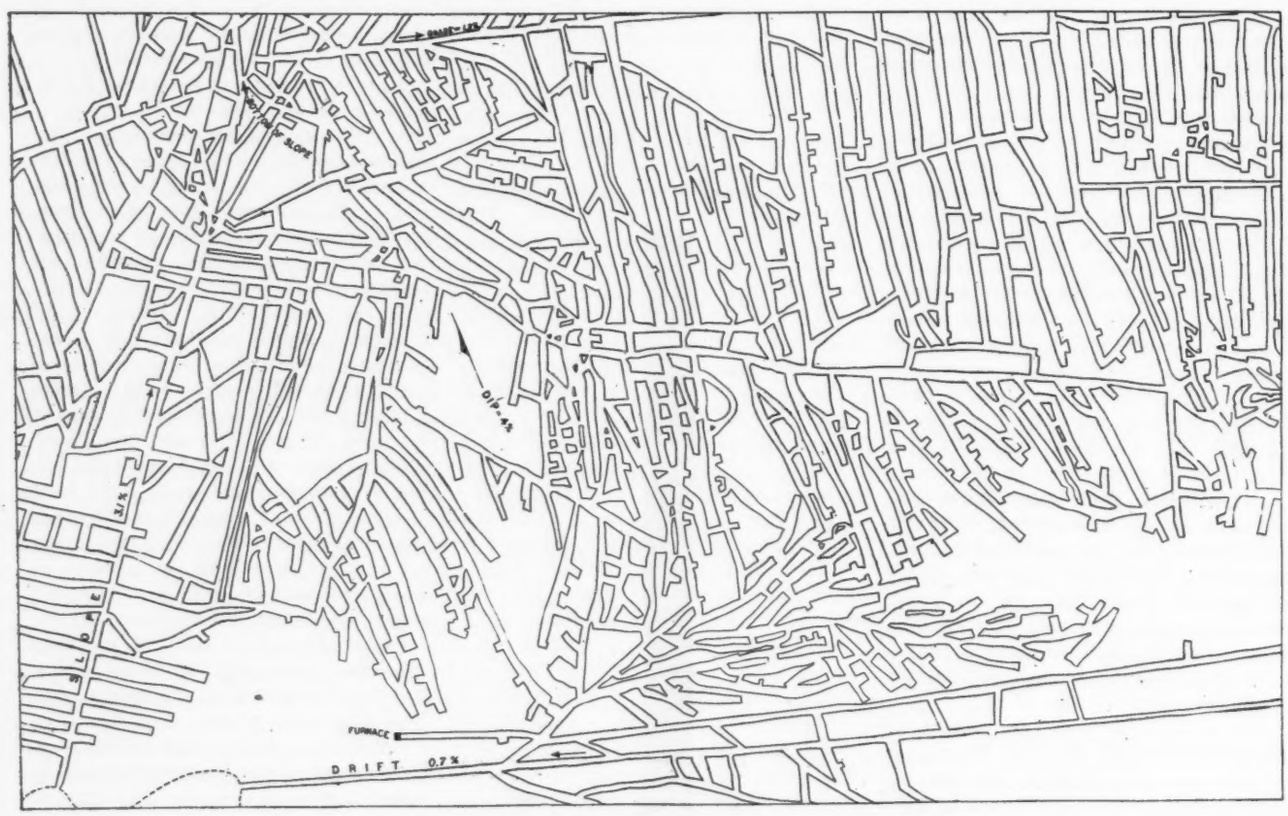


FIG. 2. METHOD OF WORKING GEORGE'S CREEK "BIG VEIN" SEAM IN 1850

Selection of Permanent Sites

After this preliminary reconnaissance has been completed and some idea of the boundaries of the property has been obtained, the selection of the sites for permanent plants is in order. The spot offering the most favorable outside features for cheap instalment of a plant is often the one accepted, whereas by selecting one with less favorable surface conditions, which, by the reasonable additional expenditure of money, could be molded satisfactorily, the best conditions favorable to haulage, drainage and ventilation in the mine could be obtained.

After the location of the new plant has been selected and the drift, slope or shaft opening completed, it must then be determined what general method of mining will be adopted; that is, whether the seam is to be worked longwall, or by pillar-and-chamber. The former is especially adapted to deep mines where the great weight of the superincumbent strata makes the pillar method impracticable, or to thin, flat seams with a brittle top under shallow cover as is found in the central Western States. The general conditions encountered thus far in the Appalachian field are probably more favorable to the pillar-and-chamber or one of its many modifications than to the longwall method of mining.

After the general method has been selected, the main headings should be commenced and driven in a direction favorable to haulage and drainage. Much money has been spent in operating properties where these two factors did not receive careful attention in the beginning. Where the seam is of uniform thickness and the dip of the measures regular, economic haulage and drainage is a comparatively simple problem, but where the measures are of a rolling nature, it may become a standing menace to cheap production. Furthermore, the employment of improper drainage methods has resulted in the abandoning of large areas and the loss of much coal in pillars. Since

main haulways and airways should be free from all interference, a traveling-way for men and animals should also be provided and therefore not less than three parallel headings should be driven for the main entries.

at the lowest cost of production, and with the greatest degree of safety to the men. Whatever method is selected, be it pillar-and-chamber with its wide rooms, pillar-and-stall with its narrow rooms, or the panel system, the great and important

termined by what judgment and experience dictate, after a careful study of the nature of the superincumbent strata. It is not intended to ignore empirical rules based on actual observation of the effect on certain stratification by the removal

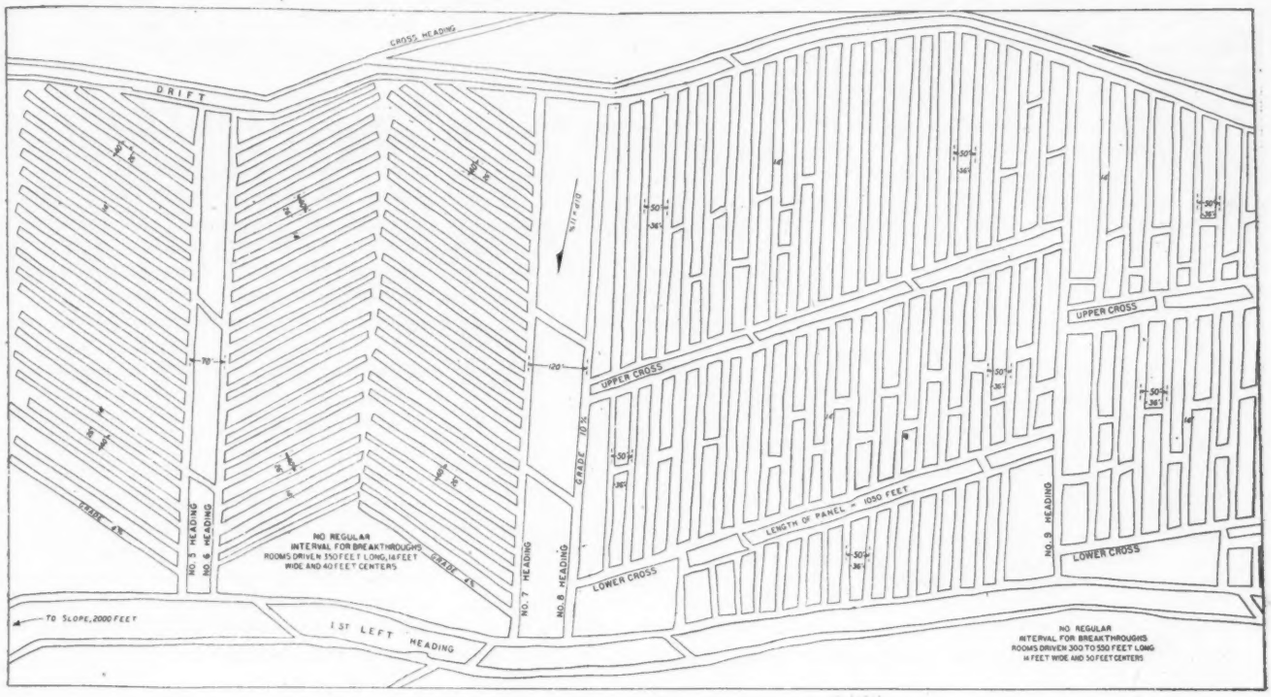

CROSS HEADING
DRIFT
UPPER CROSS
GRADE 10%
NO. 3 HEADING
NO. 6 HEADING
NO. 7 HEADING
NO. 8 HEADING
NO. 9 HEADING
LOWER CROSS
LENGTH OF PANEL = 1050 FEET
NO REGULAR INTERVAL FOR BREAKTHROUGHS ROOMS DRIVEN 150 FEET LONG, 14 FEET WIDE AND 40 FEET CENTERS
TO SLOPE, 2000 FEET
1ST LEFT HEADING
NO REGULAR INTERVAL FOR BREAKTHROUGHS ROOMS DRIVEN 300 TO 550 FEET LONG 14 FEET WIDE AND 50 FEET CENTERS

FIG. 3. METHOD OF WORKING GEORGE'S CREEK "BIG VEIN" SEAM IN 1870

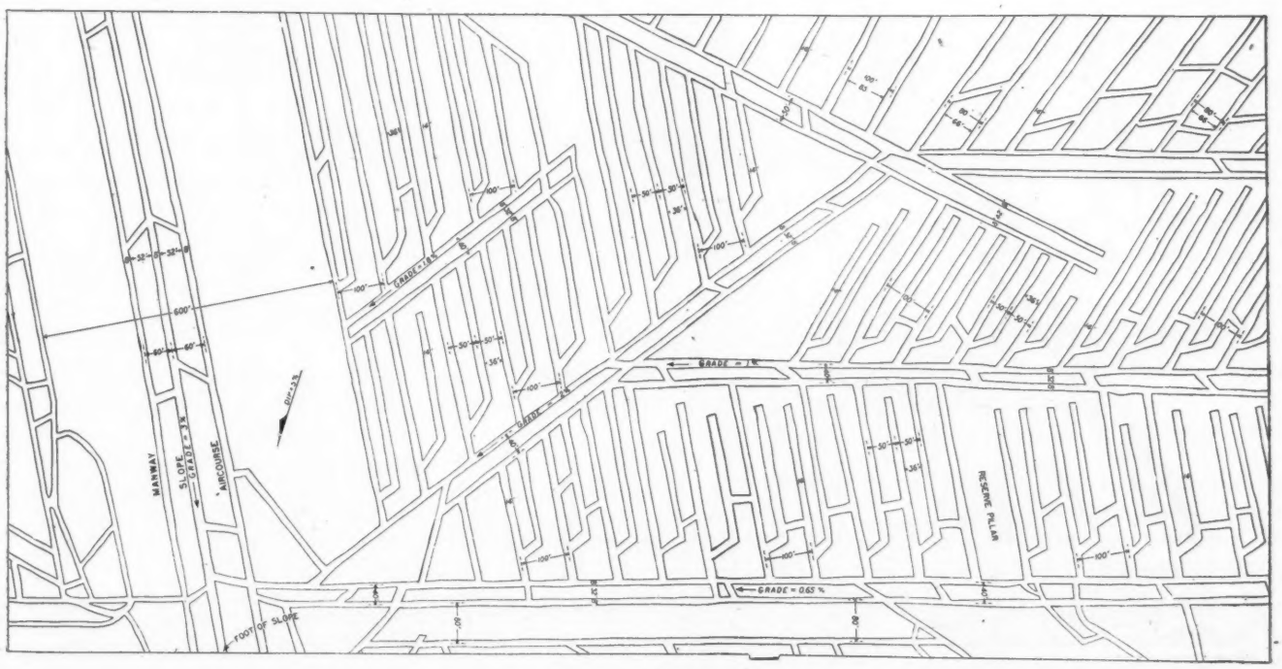


FIG. 4. METHOD OF WORKING GEORGE'S CREEK "BIG VEIN" SEAM IN 1890

SELECTING THE METHOD OF OPERATION

In determining the method of extraction to be adopted, the engineer, after a careful analysis of the data obtainable, should be careful to select that system which will effect a maximum recovery of coal in the best condition for the market,

factor to be considered is the size of the pillars to be left in first working.

Although the limit of subsidence varies with the hight of the excavation, there has never been established a uniform ratio between the two, and as a consequence, the size of pillars must be principally de-

of pillars under known conditions, but great care should be exercised in applying such rules to conditions, which, though appearing similar, may vary considerably. Only a careful study of the measures above and floor beneath the seam to be developed can give the necessary data

for intelligently determining the size of the pillars to support haulways and working places.

The Size of Pillars

The size of pillars to be left in a mine forms a question about which there are widely divergent opinions among mining men, and too much thought cannot be given to this important subject. Many thousand tons of coal lie buried and abandoned as lost beneath "creeps" and "squeezes" resulting from a lack of knowledge or foresight in this respect. There are cases on record where not only the pillars supporting the working places were too small, but those supporting main haulways, shafts and slopes as well, and a "squeeze" starting over the working places in one section of the mine has extended over the main entries, closed the shaft or slope and the whole mine has consequently been abandoned. It is better, therefore, to lay out the pillars too large rather than too small.

The principal points affecting size of pillars are depth, thickness and structure of the seam and the inclination and nature of the overlying and underlying strata. Other factors which have a bearing on this subject, because they modify the detail method of working to be adopted, are the ventilation required and the tonnage desired from each district.

Pillars should not be left standing, but taken out as soon as possible after rooms have been driven. The percentage of coal won in the first working should not be too great, because it increases the cost of re-

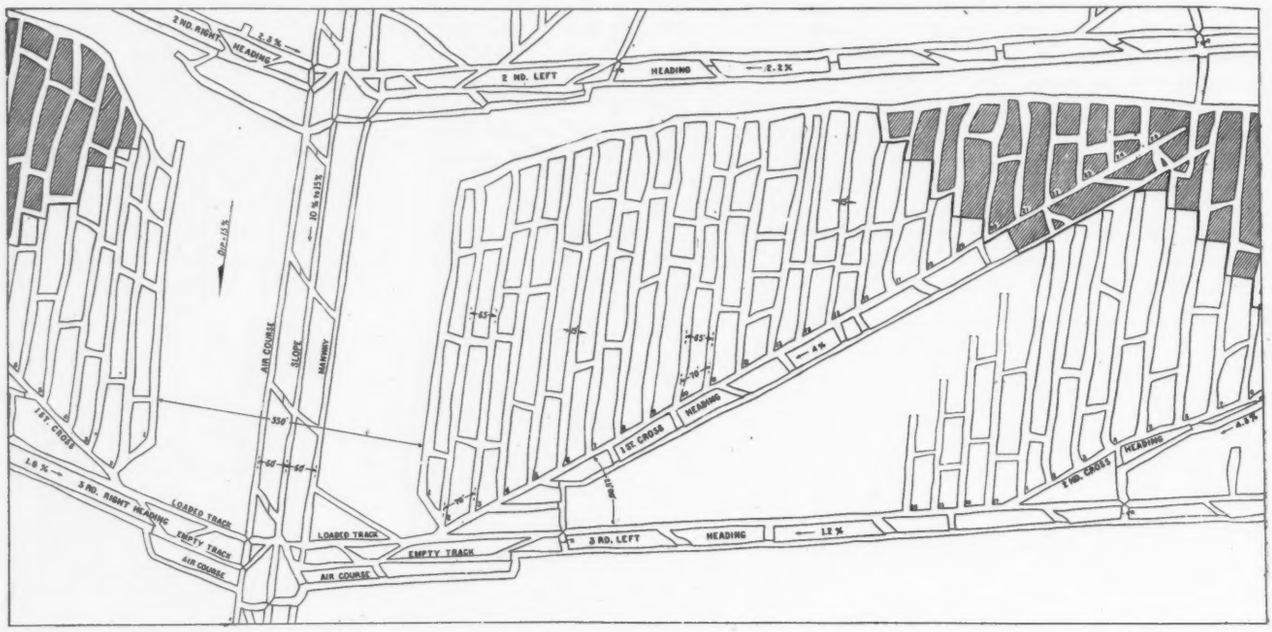


FIG. 5. METHOD OF WORKING GEORGE'S CREEK "BIG VEIN" SEAM IN 1900

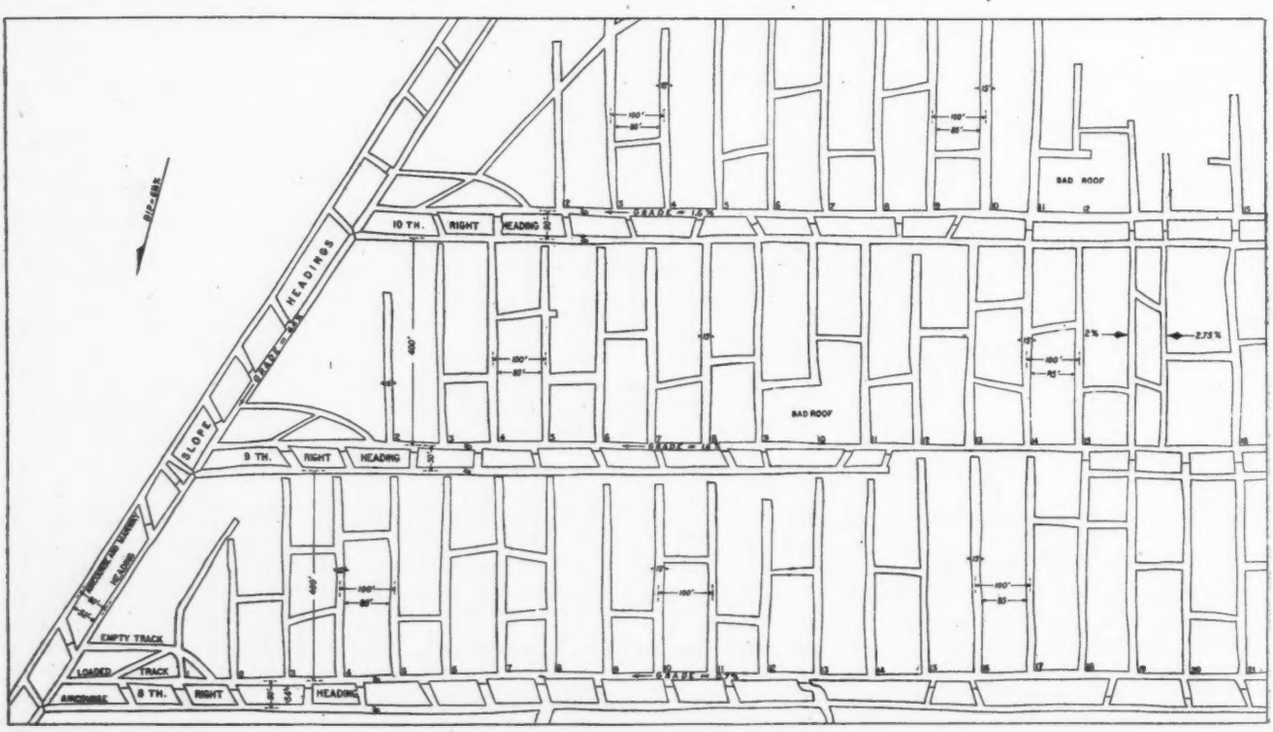


FIG. 6. METHOD OF WORKING GEORGE'S CREEK "BIG VEIN" SEAM IN 1904

covering the pillars and induces "squeezes." It is not within the scope of this paper to discuss in detail the different methods of extracting coal. There are many varying conditions existing even in the same region which sometimes render it impracticable to use a given method throughout the development of a single property without modifications.

The George's Creek Field

A region of uniform and unusually severe conditions in the bituminous fields has been selected to illustrate the results obtained over a long period. The George's creek region of Maryland with its remarkable deposit of semi-bituminous "big vein" coal has shipped its product to the market for nearly 100 years. Like all old mining regions, it has its traditions. More than one miner still lives who "dug coal" before the war with the South, and, when in reminiscent mood, he tells of the detail method of extracting the coal, on account of which thousands of tons lie buried today, much beyond recovery. One of the largest coal companies, at a considerable cost, has made a thorough and accurate resurvey of its holdings in this region, during the past six years; much abandoned territory has been mapped and the quantity of coal remaining carefully calculated.

The "big vein" seam occupies the geologic horizon of the Pittsburg bed, but differs considerably in structure and quality from the coal produced at Pittsburg, Connellsville and Fairmont. A section of the entire seam from floor to the massive rock above is shown in Fig. 1. The top coal, averaging 2 ft. thick, is left up for a roof. Where this comes down, the strata immediately above promptly follows. Very little of this top coal is, therefore, recovered. Both roof and breast of the seam contain slips known among the miners as "horsebacks," which frequently fall out without any warning. The coal is soft, and "butts" and "faces" are entirely absent.

Various Methods of Working the George's Creek Coal

The methods of extraction in vogue at different periods in the history of this field have established the fact that it is impossible to maintain wide working places for any length of time. Headings are driven 8 ft. wide, and rooms from 12 to 15 ft. In the earlier days there was practically no definite system of extraction, headings and rooms being driven at random and no pillars recovered. Fig. 2 shows such a method in use about 1850. This is reproduced from an actual survey made under the most trying circumstances. The operating company is at the present time engaged in cleaning up the heavy falls scattered throughout these workings with a view of reclaiming the pillars, which were abandoned long ago. It is estimated that fully 55 per cent. of the original coal, not counting the top coal, remains, and it is expected to recover at least one-half of this tonnage, or 27 per cent. of the original, by careful operations and the use of about double the amount of timber necessary under a good system of mining. The maximum cover over this district is 300 ft., and the few comparatively large pillars, which were inadvertently left standing at irregular intervals, saved the balance from being crushed.

In other sections of the same mine where a similar method was followed, but these large pillars not left in, the workings are entirely closed and the remaining pillars, containing over 50 per cent. of the original coal, have probably been lost forever. Fortunately, mining operations during this period were not conducted on a large scale, and, consequently, the territory thus affected is limited to a very small portion of the company's holdings.

Fig. 3 illustrates two methods followed during the years between 1870 and 1880. These workings are inaccessible to surveys at the present time owing to the "creeps" and "squeezes" induced by the irregular method of robbing the small pillars. The sketch was constructed from some old projection drawings and from information obtained from a number of men actually engaged in the work. The main headings consisting of haulage-road and airway were driven on the strike of the coal.

In the first method, the room headings were driven in pairs from the main entry at intervals of 600 ft. and on the rise of the coal on about a 10-per cent. grade. From these headings, approximately 25 rooms were driven to the right and left at 40-ft. centers on a grade of 4 per cent., giving an average length of about 350 ft. The rooms were 14 ft. wide and pillars 26 ft. These pillars were found to be totally inadequate and extracting them was impossible. Cross-cutting the pillars at frequent intervals was then attempted after completion of the rooms, but this was generally accompanied by "creeps" closing a whole district at a time. The maximum hight of the superincumbent strata in this territory is 200 feet.

The second method shown on Fig. 3 was adopted later. The maximum thickness of the overlying strata is 150 ft. By this method headings were driven from the main entry on the rise of the seam at intervals of 1000 ft. to the level above and two pairs of cross-headings were turned to the right. The rooms were driven from these cross-headings at 50-ft. intervals and 14 ft. wide, leaving a 36-ft. pillar. The length of rooms varied from 300 to 550 feet.

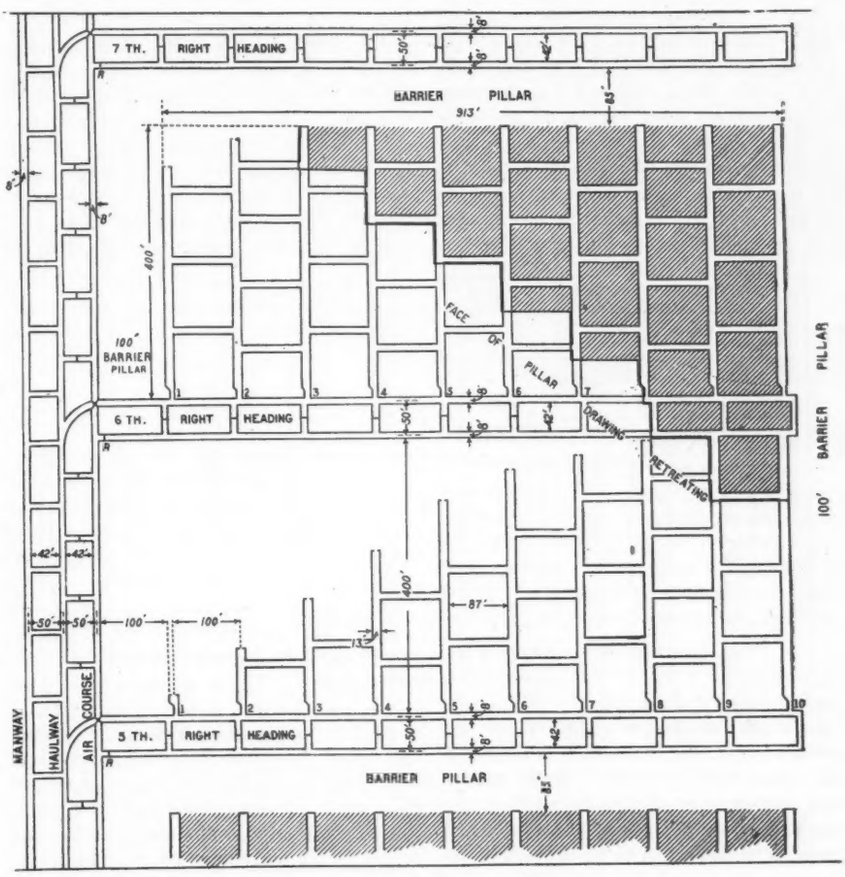


FIG. 7. SUGGESTED PANEL METHOD OF WORKING SOFT THICK SEAMS WITH BRITTLE ROOF

These pillars were also of insufficient size, robbing was conducted spasmodically and although more coal was recovered than in the adjoining districts, a large quantity was lost. In addition to the small pillars, the method of robbing them was calculated to promote "squeezes." It appears to have been the method to hold the strata with props until sufficient coal had been removed to enable the weight to break the props. As a general rule, however, before this was attained, the weight had induced a "creep" which is well known to have no limits within a territory of small pillars.

Method Used in 1890

Fig. 4 represents a method in use in 1890. The main entries were driven from the slope on the strike of the seam, sufficient grade being allowed for drainage. Cross-headings were driven on an angle of about 35 deg. to the main entry and headings were turned off these parallel to the main entry. Rooms were turned, as shown, from all headings on 100-ft. centers, and pillars were split by half-rooms to 2¼ per cent. in favor of the loads. From these haulways crossheadings are deflected at intervals of 240 ft. at an angle of about 25 deg., and driven on a grade of 4 to 7 per cent. Rooms varying in length from 100 to 800 ft. are turned on the rise of the coal from these cross-headings. The rooms are driven 15 ft. wide on 65-ft. centers, leaving pillars 50 ft. wide. Twenty-five rooms are driven in each of these diagonal panels. Unusually large protecting pillars are left along the main haulage-roads. This system has been found to be especially adapted to rapid gathering of cars, thus insuring a large tonnage.

It has been found, however, that a very large recovery from the pillars is impossible, owing to the many sharp angles, which, in a thick seam of soft coal, are always difficult and ofttimes impossible to extract. This sharp-angle method was even resorted to formerly in cross-cutting the pillars preparatory to drawing them, but this has been changed to a rectangular method, thereby increasing the actual percentage of pillar coal recovered, from 80

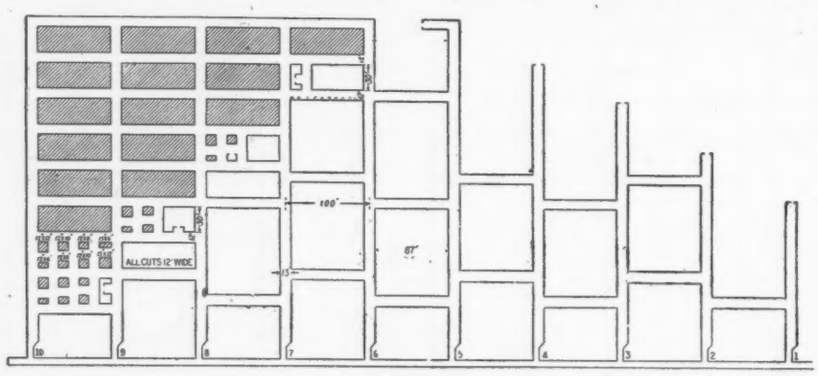


FIG. 8. SUGGESTED METHOD OF EXTRACTING COAL FROM SOFT, THICK SEAMS, WITH BRITTLE ROOF

The length of rooms varied from 300 to 600 ft., and they were 14 ft. wide, leaving pillars 36 ft. wide. These pillars were not strong enough to support the overlying strata 500 ft. high, and the usual "creep" resulted when pillar drawing commenced.

This half-room method has the advantage of facilitating gathering of coal and doubling the support of the haulway. The "squeeze" in this district could have been prevented by turning the rooms from the haulway on 200-ft. centers, and, after driving the half-rooms, the resultant pillars would be 85 ft. wide. While this would have avoided a "squeeze," the great weight to be supported by this pillar of soft coal would not have permitted a very high percentage of recovery.

Fig. 5 shows a method adopted in 1900. The maximum dip is 15 per cent., and the greatest thickness of superincumbent strata 425 ft. The slope, together with a parallel air course and manway, is sunk on the heaviest dip of the coal, and double entries are turned off to right and left at intervals of 1000 ft. on a grade of 1¼ to 83 per cent. The distance of rooms apart has also been increased in the last few years to 100-ft. centers giving pillars 85 ft. thick. It is expected that the extraction of these latter will show a further increase in the percentage of yield from pillars. The present yield from headings, rooms and pillars under this system is about 90 per cent., considering the recovery from headings and rooms as 100 per cent.

New Method Adopted in 1904

Fig. No. 6 illustrates a method instituted in the latter part of 1904. The main haulway is an extension of the slope from the opposite side of the basin. Double entries are turned off from this entry on a 1½-per cent. grade 400 ft. apart, from which rooms are driven directly on the rise of the coal. Rooms are from 13 to 15 ft. wide and practically no barrier pillar is left between the room face and the air course of the panel above. They are driven at 100-ft. intervals, leaving a pillar 85 ft. wide. The length of a panel is about 2500 ft., and contains 22 rooms.

There are five such panels in this district, and when completed, it is proposed to draw the pillars in a retreating fashion with the line of pillar work on an angle of 45 deg. across the whole district. A similar method in another district, but with rooms on a deflection of 35 deg. from a right angle, is yielding 88½ per cent. from the pillars with a total recovery of 94 per cent. from headings, rooms and pillars, and it is believed that this can at least be duplicated if not exceeded in the case of Fig. 6. The maximum dip in this district is 6½ per cent. and the greatest hight of the overlying strata 250 feet.

A Suggested Panel Method

With this resumé of systems used at different periods under conditions now known, a suggested method of extracting the coal from thick soft seams with a brittle top and a hight of superincumbent strata of 400 ft. or less is presented in Fig. 7. The general designs of the mine for haulage, drainage and ventilation are not given, because they are variable quantities, depending on conditions which change with the locality, and the method suggested is, therefore, limited to the ultimate recovery of the coal.

By this method a territory under development is divided up into rectangular panels of ten rooms each. The room headings are driven on easy grades favorable to drainage and haulage and the panels are worked in pairs. When the upper heading has been driven to its end, the rooms are turned at intervals of 100 ft. with the drawing of pillars following by the retreating method. The rooms are 400 ft. long and 13 ft. wide, leaving pillars 87 ft. in width. The rooms in the upper panel are limited by a barrier pillar separating them from the heading above and those on the lower panel are driven through to the "gob" of the upper panel. The line of pillar work extending over the two panels should have an angle of about 45 deg. The length of rooms can be varied to suit the conditions, and when the hight of the overlying measures exceeds 400 ft.; the thickness of pillars should be increased accordingly.

Fig. No. 8 shows the method of drawing the pillars in detail. The rectangular method should be carefully adhered to and all sharp angles avoided.

When the work commences, a cut is made separating a block of coal 30 ft. wide and 87 ft. long. This piece is further subdivided into blocks varying from 6x12 ft. to 15x12 ft. in size, which are cut off and extracted successively, as shown. In no case should the small blocks cut off exceed in size the distance a man can shovel under average conditions, which is about 15 ft. The largest of the small blocks should be removed last because it is there that the greatest

pressure manifests itself in the removal of the original block cut from the pillar. When this block has been removed, another cut is made and the process repeated.

The line of "gob" should be approximately on an angle of 45 deg. If it is found impossible to take out the small blocks clean, on account of the "gob" from the preceding work running in on the new cut, a row of props can be set on the upper side of the large block to hold the "gob" when the small blocks below are removed. This method of working should result in a total average recovery of fully 95 per cent. of the seam from headings, rooms and pillars and insure the workings against "creeps and squeezes."

The Tennessee Copper Company in 1908

By B. Britton Gottsberger*

The year 1908 was for the Ducktown copper district a busy one, in marked contrast with that of most of the copper-mining centers of the country. The Tennessee Copper Company mined during the year 501,000 tons, and smelted 476,000 tons of ore. The copper production will amount to approximately 14,500,000 pounds.

The labor situation which has, on account of the isolated location of the mines, always been a serious one, was much relieved by the general business depression, and while the actual number of men employed did not much exceed that of 1907, a great increase in efficiency was obtained, resulting in increased output and a material reduction in working costs.

The decrease in the price of copper prevented making any but the most necessary additions to the plant, but the development of the mines was actively pushed. The shaft at the Burra Burra mine was sunk to the seventh level and the drifts on the third level, which had been in progress for some time, were completed; so that the orebody is now opened up on that level for its entire length, a distance of more than 2000 ft. Diamond drilling in the new ground developed a large orebody in the north end of the mine.

At the Polk county mine an additional level was opened and a considerable body of ore of good grade was exposed and will soon be ready for stoping.

Steam Shovel Underground

An item of interest, as regards the mine work was the trial of the method of loading ore in the stopes by means of a special shovel furnished by the Bucyrus company. The shovel operated by compressed air worked smoothly, no difficulty being experienced in handling ore which had been broken to a reasonable size. Its use was, however, not found to be an advantage, since it was difficult to obtain a sufficient tonnage in one stope to meet the capacity of the shovel.

In attempting to do this large blasts were necessary, and great difficulty was experienced in breaking large pieces of ore, after the blast, to a proper size for handling by the shovel and later by the crusher. The shovel itself would easily handle any pieces small enough to pass through the dipper, which was of 1¼ cu.yd. capacity; but after hoisting to the surface many of the lumps proved too large for the 18x36-in. Blake crusher, and hoisting was often interrupted on this account. These difficulties were mainly due to the small space available for working the shovel, the face of the stope being about 80 ft. wide. The shovel has been transferred to the company's quartz quarry where flux for the smelter is obtained, and at this point it is doing excellent work.

Smelting

At the smelter no special change in methods of operation occurred, the most important fact developed during the year being that while the production in one operation of a matte of converter grade (30 per cent. or more) is quite feasible and in fact was made for one month on practically all the furnaces, the copper losses by this method were larger than the loss by smelting in two operations. It is hardly likely that any further attempts along this line will be made.

The adoption on the blast furnaces of a slotted tuyere 12 in. long by 4 in. wide, in place of two tuyeres 3¼ in. in diameter each, proved a decided success, remedying the defect of too small tuyere area in the original design. The furnace equipped with these new jackets handled a much larger tonnage than the others, and the new tuyere will be adopted on all the furnaces.

When the smelter was built the method of conveying air to the blast furnaces was by independent blast pipes from each engine to the various furnaces. On account of changes to the furnaces this system was abandoned; all engines now deliver air to one large air main from which connections are made to the different furnaces. No change in the operation of the furnaces was noted with the new arrangement, and its flexibility will be a decided advantage in operating the furnaces for the production of gas for the acid plant, removing all danger of the blast's being cut on the furnace from failure of the engine.

Sulphuric-acid Plant

The development of greatest interest was that of the sulphuric-acid plant. The year was largely spent in gaining experience as to the proper method of correlating the work of the smelter and the acid plant and solving the many problems which naturally arise in so novel an undertaking. It was found that a radical change in the construction of the furnace tops was necessary, and that special care must be taken at all points to prevent the dilution of the gases by means of false air. After some preliminary attempts a comprehensive plan was devised, and is now being executed, which will completely solve the question of converting the sulphur fumes into commercial sulphuric acid on a profitable basis, rendering available the sulphur hitherto wasted, but now considered a constituent of the ore no less valuable than the copper. The development of the plant will undoubtedly control the fumes to such an extent that the troublesome question of damage to vegetation, which has so long been a matter of dispute, will be eliminated.

*General manager, Tennessee Copper Company, Copperhill, Tenn.

The Question of Expert Evidence

The New York State Bar Association has been considering reform in legal procedure, especially with respect to expert evidence. While its deliberations have pertained particularly to medical testimony, practically the same things may be said as to engineering evidence and consequently we deem the matter to be of interest to our readers.

Protesting against "the commercializing of scientific knowledge," which "lessens its accuracy and value," the report of the committee of the Bar Association makes a plea for the insuring of such conditions that expert witnesses, without regard to anything but justice and truth, may give their testimony without bias and without being subjected to improper and contemptuous cross-examinations, misrepresentations and other things tending to create an atmosphere in which the scientific mind cannot be expected to reason calmly and logically.

The committee's report, which was adopted, included a proposed statute as a beginning of the desired reform. It provides briefly that justices of the appellate division shall designate at least 10 and not more than 60 physicians in each judicial district, who may be called as medical expert witnesses by the trial court or by any party to a civil or criminal action; when so called they shall testify and be subject, like other witnesses, to examination and cross-examination. They shall be paid out of the county funds on the order of the trial judge, who shall also decide the amount of the fee. The report in part follows:

"It is apparent to all that theoretically an expert is the scientist interested solely in facts who should retain freedom of judgment and liberty of speech and should be free from the embarrassment of any personal relations to or with the parties to an action; that he should have no client to serve and no partisan interest nor opinions to vindicate; that he should give his opinion as the advocate neither of another nor himself; that when he speaks he should do so judicially as the representative of the special branch of science which he invokes, governed by the opinion of the great body of scientists in this relation and in accordance with their most recent investigations.

"That no one should be permitted to distort, pervert or misrepresent his testimony; that when this is done and not until it is done shall we have expert testimony rescued from the disrepute into which it has fallen and thus elevated to its true position as the expression of the particular science for which it speaks; that by the adoption of some such system the mature judgment of the best minds could be obtained and the superficial opinions of quacks and mountebanks would not be thrust upon the jury to their confusion and the hindrance of justice; that such scientific openmindedness is almost impossible where the expert entirely depends for his emolument upon the good graces of contending parties and largely is without the recognition and protection of the court.

"That the commercializing of scientific knowledge under the existing conditions lessens its accuracy and value. That the enormous modern development of special knowledge makes doubt and controversy among experts hired to create it inevitable and aggravates the evils of private expert hire, unscrupulous so-called experts finding it easy to lease themselves and their opinions to aggrieved and aggressive parties who may profit either fairly or unfairly by the technicalities and doubts which they are able to inject into the case in full consciousness that no rebuke will be administered by the tribunal before which their testimony is given; that, therefore, the gravest abuses, not to say scandals, in the introduction of expert testimony have arisen until it has come commonly to be believed that such witnesses are so biased if not corrupt that hardly any weight should be given to their opinions.

During the last 20 years, since the introduction of deep wells in Burma, the petroleum output has grown to about 138,000,000 gal. per year ("Sketch of the Mineral Resources of India"). This has reduced the import in 10 years from 87,000,000 to 62,000,000 gal. even with the constantly increasing consumption. The export of paraffin wax has meanwhile steadily grown.

Refusal to Adjust Prices, a Menace to Prosperity

Elliott C. McDougal, president of the Bank of Buffalo and the newly elected president of the Buffalo Chamber of Commerce, made the following remarks at the annual banquet of the latter organization:

"Never after any previous panic within the recollection of living men have the underlying conditions necessary for the resumption of prosperity been so universally encouraging. After no previous panic have railroads been in so strong a position. After no previous panic have farmers been so prosperous. After no previous panic have we had what we have today—a business public with its material resources, its confidence and its mental vigor unimpaired, ready boldly to take advantage of business opportunities.

"With the exception of the tariff agitation, there is only one small cloud in the sky, and as yet it is only of the size of a man's hand. I refer to the present tendency to maintain, and in many cases to increase, prices. A dealer in leather belting told me the other day that prices had recently risen 15 per cent. I have read that the printers expect to raise prices in the near future. Lumbermen say that they expect that prices of lumber will rise. Many other industries take the same position. The largest industrial corporation in this country—the United States Steel Corporation—is officered by men of ability; men whom an ordinary man hesitates to criticize, but there can be no reasonable doubt that the present policy of the United States Steel Corporation and its attitude with regard to the maintenance of prices is in danger of administering a very severe check to business. I am not competent to argue with a lumber dealer concerning a business about which I know nothing, and about which he knows everything. I am not competent to argue technically with a printer or with a leather dealer, or with the officers of the United States Steel Corporation, but I know that the average scale of prices must come down; that we will have no lasting return toward prosperity until it does come down. If we do not make prices to encourage business we may have no business. We are facing a period of forced economies and of smaller profits. Out of this period will come increased efficiency and new prosperity. The sooner these facts are recognized and acted upon by business men, the sooner will we get started on the road to permanent recovery."

On the same line the Pittsburg correspondent of *The Evening Post* writes under date of Jan. 29, especially with respect to the Steel Corporation:

"Why should the progressive improvement of the last months of 1904 not have been repeated in 1908? One answer is very frequently heard nowadays in Pittsburg. Between the beginning of trade reaction in July, 1903, and the middle of 1904, steel prices had been severely readjusted; there was, therefore, even ignoring the question whether or not the consuming community was less hard hit than it is today, a strong incentive for buyers to come at once into the market. The Steel Corporation offers no such incentive today. Both labor and materials had been reduced in the reaction of 1903, whereas, with minor exceptions, wages have this past year remained at the high level of the boom period, for skilled labor at any rate, and there has been organized effort to sustain an artificial price level for finished and semi-finished products. It is true that a number of reductions were officially made last June, but they were very slight, and it is the practically unanimous opinion among representative trade authorities that recuperation has been retarded by seeking to maintain a selling level far above the ideas of the general consumer.

"As matters stand today, price cutting has been freely admitted for some time; it is now openly stated here that the Bethlehem, Lackawanna, and Inland Steel companies have taken a hand in it, that even the Jones & Laughlin Steel Company has been making concessions recently. In other words, producers are taking the business offering below established prices. This is believed to apply chiefly to plates, shapes, tubing, and sheets. It has, however, been stated that the Steel Corporation will not meet the cuts, but it is not stated that official reductions are not likely.

"There are steel manufacturers who defend the attempt to keep prices at a reasonable level because of the high prices prevailing in other industries. The quotations on wheat, corn, and oats, on live stock, lumber, leather, brick, plate glass, textiles, etc., are all referred to in justification. But this does not help the matter with consumers. If the tariff is reduced as it now appears it will be, a wage reduction is predicted.

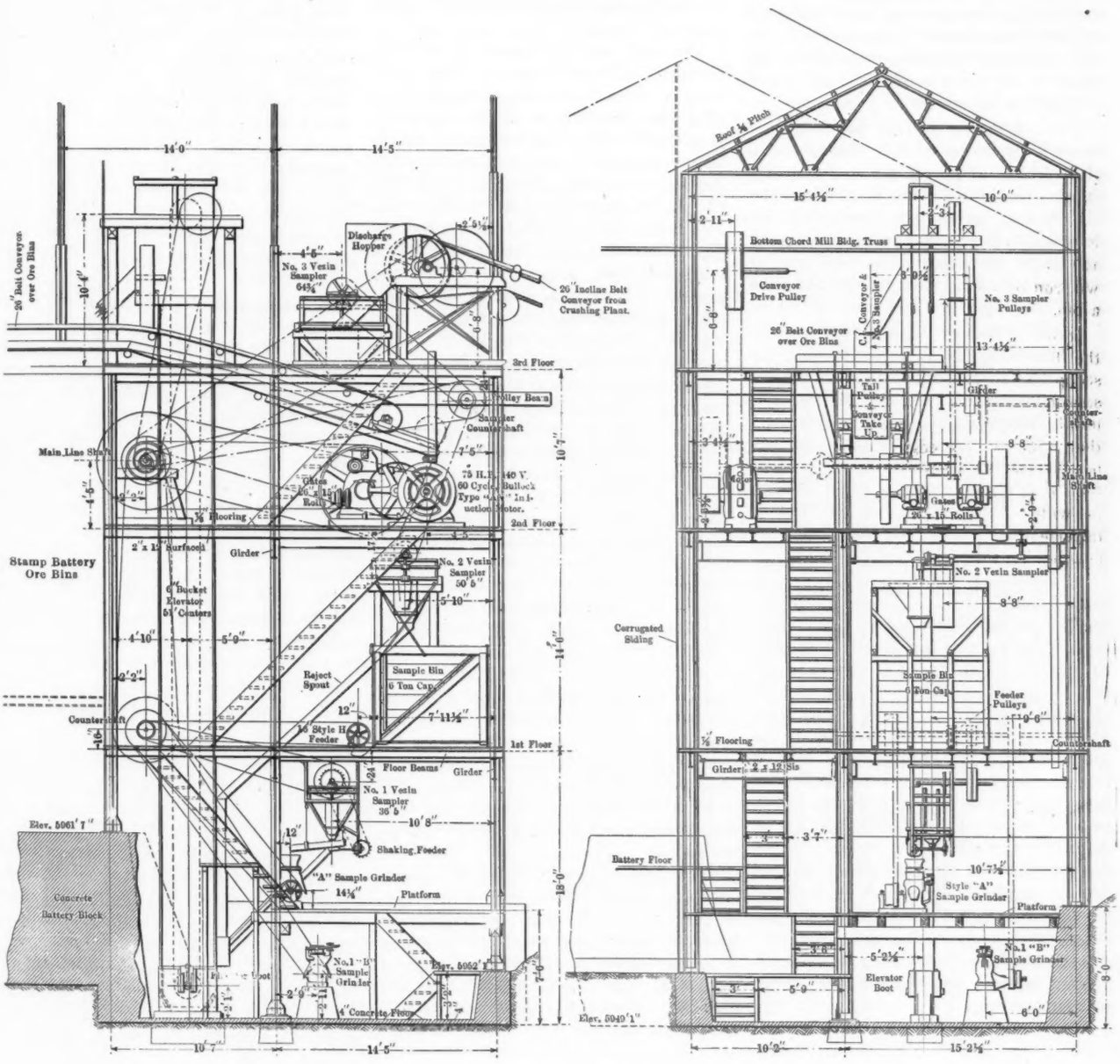
"Meanwhile Pittsburg expects an indifferent market for iron and steel and is still looking for the reduction in prices which it is contended is necessary to revive business. At the same time, it is admitted that never before have farmers been so prosperous, the railroads in so high a state of efficiency, and the signs of real prosperity so abundant in the first year after a serious panic."

Blanketing having a special texture similar to that of the ordinary military rug is used (*Journ.*, Chem., Met. and Min. Soc. of South Africa, Nov., 1908) on the blanket tables at the Giant ,mine, Rhodesia. The slime from the blanket tables is then treated on canvas tables covered with best fine white duck canvas.

The Goldfield Consolidated Sampling Mill

By John A. Church*

All of the sampling mills that have been illustrated in the Journal, work on a quantity of ore that is only a part of the mine's daily output, or of a purchased lot, and the first cut, which may be either 5 or 10 per cent., corresponds to the whole quantity received by mills of the other sort. No handwork and no operation of human agency affects the result which is produced entirely by automatic machines, down to the usual coning floor. Many details of this mill were given in the Journal of Sept. 5, 1908. The construction is shown in the accompanying illustrations.



SAMPLING MILL, GOLDFIELD CONSOLIDATED MINES COMPANY, GOLDFIELD, NEVADA

a fifth or a tenth, and this portion has been obtained usually by taking every fifth or tenth car or bucket of ore. The Goldfield Consolidated mill operates on a different system and one that is interesting and important from the fact that it is likely to be the system of the future. All the ore goes through the sampling mill,

The ore is crushed outside the mill and screened in a revolving trommel with 1½-in. perforations which gives a ring size of 1¼ in. All oversize is returned to the crusher and the screened product goes to the mill *via* a 26-in. belt conveyer. It falls into a small hopper which feeds a No. 3 Vezin sampler of 48 in. diameter in the sampling circle, taken at the center of the stream. The velocity in this circle will be 175 to 200 ft. per minute. The cut will be 5 per cent. with one scoop, or 10 per cent. with two. The reject falls to a belt conveyer which moves directly under the sampler and runs to the stamp mill bins.

The first cut falls four or five feet to Gates 26x15-in. rolls running at 97 r.p.m. and is reduced to ⅜ in. The rolls are directly over and about 3 ft. above a No. 2 Vezin, which has a sampling diameter of 38 in. and will have the same speed per minute. Here again the cut is either 5 or 10 per cent.

Novel Features

The second cut falls into a small bin holding 6 tons or 1 per cent. of the day's supply. It is fed by a shaking spout to a No. 1 Vezin with sampling diameter of 27

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in. and the same speed as the others. It will cut out 5 per cent., and the cut falls upon a shaking feeder which delivers to a sample grinder where it is ground and halved. It is further ground and halved in two other sample grinders so the final sample amounts to 75 lb. or ⅛ lb. per ton of supply.

This mill is noticeable for the fact that there is only one recrushing and two samplings before the sample grinders are reached, for the first cut takes the place of work that usually is done outside the mill. This can be done at Goldfield because of the fineness to which the ore is crushed for the stamps.

The ore supply will be 600 tons in 8 hours or 75 tons per hour. The first sampler receives 42 lb. per sec. or nearly 156 lb. per revolution. The second sampler (if the first cut is 10 per cent.) will receive 4.2 lb. per second and (at 20 r.p.m.) 12.6 lb. per revolution. The third sampler will run on a solid stream, being fed from a bin.

It will be noticed that the feed spout to the first sampler is placed so that the scoop cuts from front to back of the ore stream instead of from side to side as is usual. The stream is probably less thick than wide and the edge of the scoop will pass across the thickness in shorter time than when it has to pass across a spout 12 in. wide. This will shorten the time of imperfect, or selective, sampling and lengthen the time of perfect work.

In examining the designs of various mills I have noticed that some scoops cut the ore stream from side to side, others from front to back and others from back to front. In no case was this variation due to intention. Always it was merely an accident of construction, some beam preventing the convenient placing of the spout so as to obtain the usual side to side cut and causing an installation that gave oue of the others and which one seems to depend entirely upon which way the motor happens to turn round. I think there is a choice between these ways of cutting and that the cut from back to front of the stream has advantages over the others.

A bucket elevator with 51-ft. centers lifts all rejects, after the first cut, to the mill bin conveyer.

Courtland, Arizona, a New Copper Camp

By H. W. Chittenden*

The new copper camp of Courtland, which is now attracting much attention in the southwest, is situated in the central part of Cochise county, 35 miles north of Bisbee, and nine miles south of Pearce, a silver camp on a branch of the Southern Pacific railroad. For several years a little prospecting work was done near the surface, and a little ore was shipped by wagons to Pearce from this district, formerly called the Turquoise district. But only with the recent advent of the Calumet & Arizona and Copper Queen companies into the camp, and the development of large orebodies on the property of the Great Western Copper Company, has the district assumed any considerable importance.

*Mining engineer, Cananea, Mexico.

The rock series at Courtland consist of quartzite, probably Cambrian in age, overlaid by limestone that probably includes ages from the Cambrian to the Upper Carboniferous. The total thickness of the limestone does not appear to be more than 2000 ft. The whole series has been tilted to a fairly uniform, steep northeast dip, and many large faults have broken the formation into rather small fault-blocks, duplicating the sedimentary series and greatly increasing its apparent thickness.

Into these sedimentary rocks, have been intruded two igneous rocks, a rather coarse-grained diorite porphyry, and a quartz porphyry that varies in texture from very fine to fairly coarse grain. The diorite porphyry varies greatly, in places being almost entirely free from quartz, and in others containing many large quartz crystals. There have probably been several distinct intrusions of diorite porphyry. The age relation between the two igneous rocks has not yet been definitely determined, since the two come in contact in very few places, and the contacts are for the most part covered with talus.

The Orebodies

The ore in the district occurs along zones of fracture in the limestone and quartzite, replacing the rock between the fractures. In all places so far discovered the ore has been closely associated with one or both porphyries, and probably both have been instrumental in the formation of the ore.

The primary ore, as shown in the deeper workings in the western part of the camp, is a mixture of iron and copper sulphides in a silicious gangue usually resulting from the alteration of limestone. Except for small rich streaks, the primary ore has been of very low grade. Secondary alteration, however, has resulted in great enrichment and in the eastern part of the camp the bottom of the enriched ore has not yet been reached. The secondary ore consists of malachite, azurite, cuprite, and other oxidized copper minerals, in a gangue of iron, manganese, and aluminum oxides, often very siliceous. The oxidized ore is often of very high grade. Beautiful specimens of crystallized malachite, azurite and cuprite are fairly abundant. Surrounding the ore are large masses of nearly barren siliceous iron and aluminum oxides, passing into the unaltered country rocks.

The orebodies are usually marked on the surface by large outcrops of gossan, often copper stained.

The Copper Queen, Calumet & Arizona, and Great Western companies are each operating two shafts, and a few smaller prospecting shafts are also in operation. The Copper Queen has considerable ore developed about the Casey shaft, and is sinking the Silverton shaft to open up the eastern part of the camp. The Calumet & Arizona has large orebodies blocked out at the Germania shaft, and is sinking the April Fool shaft to develop the northern part of the camp. This company is also exploring its territory with a diamond drill. The Great Western company has fine orebodies well opened up at the Mary shaft, and also has much ore near the surface at the Humboldt shaft. At the Leadville shaft, belonging to an independent operator, some sulphide ore of good grade has been encountered.

A company has been incorporated under the laws of Arizona to build a railway connecting Courtland with Douglas, where the Copper Queen and Calumet & Arizona smelters are situated. This road, which is to be called the Colorado & Mexico railroad, will be controlled by the Phelps-Dodge interests, and operated in connection with the El Paso & Southwestern. The length of the line with its spurs will be about 45 miles. Surveys for this road are already well under way, and construction will probably be started very soon. Ore can be shipped from several of the shafts as soon as the railroad is finished.

Transvaal Gold Mines

In the cabled reports from South Africa there has been some confusion, owing to the fact that some of the reports sent were from the Witwatersrand only. The statement of the Chamber of Mines gives the values of gold for the full year from all Transvaal mines at $133,364,858 in 1907. and $145,793,702 in 1908; an increase of $12,428,844, or 9.3 per cent. last year.

The labor statement gives the following comparison for three years past, showing the total number employed at mines and mills—not including Europeans—on Jan. 1 of each year:

	1907.	1908.	1909.
Kafirs	83,567	118,204	148,722
Chinese	53,828	31,840	12,283
Total	137,395	150,044	161,005

This shows the changes made since the passage of the law against Chinese labor. Most of the natives now coming to the mines are from north of the Zambesi, and require some time to become accustomed to the work, and to the climate of the Transvaal. The Chinese will probably disappear in the course of the present year.

American Institute of Mining Engineers

A provisional program has been arranged for the 96th meeting, to be held at New Haven, Conn., beginning Feb. 23. This program is subject to such changes as may be made advisable by circumstances not now foreseen. The sessions will be held in North Sheffield hall of Yale University. The leading topics of discussion to be presented at the first three sessions are stated below. It is understood that if the special topic assigned to any one of the first three sessions should require either more or less than the time provided, the pending discussion may be adjourned, or papers on other subjects may be introduced.

Tuesday evening, Feb. 23. Opening session. Leading topic: The Conservation of Natural Resources. Papers by Dr. James Douglas and others.

Wednesday, Feb. 24. Morning session. Leading topic: A Sea-level Canal at Panama. Afternoon session. Leading topic: The Technical Education of Mining Engineers. After the latter session a visit will be made to the Hammond laboratory and other buildings of Yale University. Evening session. Papers on general subjects.

Thursday, Feb. 25. Morning and final session at New Haven for the reading and discussion of papers. It is, however, probable that a supplementary session of this meeting will be held at New York City in March, 1909, as a joint session of the Institute with other national engineering societies, for the further discussion of the Conservation of Natural Resourecs.

On Thursday afternoon, visit to the works of the National Pipe-Bending Company (exhibiting the electric, oxy-acetylene, and thermit processes of welding); the plant of the New Haven Gas Company, and the Bigelow boiler works. On Thursday evening a reception will be given to members and guests of the Institute by the governing board of the Sheffield Scientific School, at Byers Memorial hall.

Friday, Feb. 26. Excursion, embracing visits to the Farrel Foundry and Machine Works and the brass and copper rolling mills of the Coe Brass Company, at Ansonia; reception and luncheon at Bridgeport, tendered by the Bridgeport Board of Trade; and visits to the Locomobile works, the American Tube and Stamp works, and the works of Crane & Co., at Bridgeport.

On Friday evening, Dr. R. W. Raymond will deliver at North Sheffield hall, in the Sheffield scientific course, a lecture on the Influence of Geology upon the History of Jamaica, to which members and guests are invited.

Saturday morning, Feb. 27. Visit to the Cos Cob power plant of the New York, New Haven and Hartford railroad. Arrangements will permit members returning to New York on Saturday to join.

Papers Announced

The majority of the papers in the following list will be, as usual, read by title, or presented in brief oral abstract only. Printed copies of many of them will be on hand at the sessions:

1. Conservation of Natural Resources. By James Douglas, New York.
2. The Work of the National Conservation Commission in Relation to Mineral Resources. By Joseph A. Holmes, Washington.
3. Conservation of Natural Mineral Resources of the United States. By John Birkinbine, Philadelphia.
4. The Mineral Wealth of America. By R. W. Raymond and W. R. Ingalls, New York.
5. The Future Supply of Iron Ore. By Henry M. Howe, New York.
6. A Sea-Level Canal at Panama—A Study of Its Desirability and Feasibility. By Henry G. Granger, Cartagena, Colombia.
7. Technical Education of Mining Engineers. By Cortlandt E. Palmer, New York.
8. The Mining Course at the Sheffield Scientific School, Yale University. By John D. Irving, New Haven, Conn.
9. The Hammond Mining Laboratory at Sheffield Scientific School, Yale University. By Louis D. Huntoon, New Haven, Conn.
10. Biographical Notice of James D. Hague. By R. W. Raymond, New York.
11. A Proposed Hydraulic Gold Dredge. By Henry G. Granger, Cartagena, Colombia.
12. The Residual Brown Iron Ores of Cuba. By C. M. Weld, New York.
13. Pressure Fans *vs.* Exhaust Fans. By Audley H. Stow, Mayberry, W. Va.
14. Blast Pressure at Tuyeres and Inside the Furnace. By R. H. Sweetser, Columbus, Ohio.
15. The Limit of Fuel Economy in the Blast Furnace. By N. M. Langdon, Mancelona, Mich.
16. Pan-Amalgamation; an Instructive Laboratory Experiment. By H. O. Hofman and C. R. Haywood, Boston.
17. The Concentration of Silver-Lead Ores. By V. T. Stanley Low, Broken Hill, Australia.
18. Slime Treatment on Vanners. By Rudolf Gahl, Morenci, Arizona.
19. The Lixiviation of Low-Grade Copper Ores. By A. L. Sweetser, Boston.
20. The Influence of Bismuth on Wire-Bar Copper. By H. N. Lawrie, Portland, Oregon.
21. Metal Losses in Copper Slags, and a Means of Reducing Them. By Lewis T. Wright, San Francisco.
22. The Laws of Fissures. By Blamey Stevens, Seattle, Washington.
23. The Geology of the Mount Morgan Deposit. By J. Bowie Wilson, Sydney, Australia.
24. Kentucky Fluorspar, and Its Value to the Iron and Steel Industry. By F. Julius Fohs, Lexington, Ky.
25. The Association of Vanadium with Hydro-Carbons. By D. Foster Hewett, Pittsburg.
26. Discussion of the paper of John Hays Hammond, "Professional Ethics." By Henry Louis, Newcastle, England.
27. Discussion of the paper of J. J. Rutledge, The Clinton Iron-Ore Deposits of Stone Valley, Huntingdon County, Penn. By William Kelly, Vulcan, Mich.
28. Discussion of the paper of Carl Scholz, Effect of Humidity in Mine Explosions. By Howard N. Eavenson, Gary, W. Va.
29. Discussion of the paper of Albert Bordeaux, The Silver Mines of Mexico. By Alfred H. Bromly, Mexico.

The Annual Election

The following list comprises all the nominations so far received for officers and members of the council, to be voted for—in person or by proxy—at the annual meeting, which will be held at the office of the Institute in New York, Feb. 16: President, D. W. Brunton, Denver, Colo.; vice-presidents, H. V. Winchell, St. Paul, Minn.; W. L. Saunders, New York; W. C Ralston, San Francisco; councillors, A. C. Humhreys, New York; W. G. Miller, Toronto, Ont.; Karl Eilers, New York; secretary, Dr. R. W. Raymond, New York.

A Novel Belt Conveyer

A novel arrangement of belt conveyers is a combination of two belts at right angles to each other recently installed by the Robins New Conveyor Company, New York, for the power house of the Buck Eye Pipe Line Company, Green Springs, Ohio. The problem to be solved was the storing of coal in an overhead bin. While this could be accomplished by two lines of belt conveyers, yet with a combination of a main belt and a cross belt in the same plane but perpendicular to it, one of the long belts is done away with, thereby saving 100 ft. or more of conveyer, besides having a simpler and less expensive outfit. The main belt is of the usual Robins' type with a tripper to which one end of the cross-belt is attached and the other supported by a rail fastened to and extending along the side of the building. The tripper and cross-belt thus move as one.

Colliery Notes

A nitroglycerin explosive is less sensitive with a small diameter cartridge, but an ammonium nitrate explosive is more sensitive with a small diameter cartridge.

Telephonic or telegraphic communication between various parts of the workings of all coal mines and the manager's office, or other suitable place at the shaft head, should be compulsory in all dangerous mines; similar lines of communication should be maintained from the offices to the fan and engine houses and rescue stations.

In many European mines where shots have been fired by electricity, the custom has been to use primary batteries. The latter are less costly to start with, but soon get out of order, and as a consequence, many superintendents now advocate the use of a good magneto machine, which is more reliable, and although it costs considerably more, it is easily kept in good order.

A recently published record of underground costs for working a 2-ft. seam of coal as compared with similar expenses incurred in working an 8-ft. bed showed a difference in cost of 17c. per ton in favor of the thicker seam. The cost sheet from which the figures were taken is complete in every detail and gives a fair idea of the extra expense that will result when we attempt to work our very thin seams.

As a general rule, a coal seam with heavy top and highly pitched, is best worked with a stepped face, which permits a better control of the weight. In a flat seam or one that is only slightly inclined, where mining machines are employed, if the roof will permit, it is best to work such a seam with a straight face so as to eliminate the necessity of moving the cutting machine from place to place.

The two principal dangers which arise through want of sanitation in mines are (1) spread of ankylostomiasis, and (2) spread of typhoid fever. Concerning the first disease, it is a matter of record in German mines that ankylostomiasis was not a serious matter until they commenced to water the mines. The Germans, however, were compelled to choose between two evils, and they preferred to be free from the danger of dust explosions, at the same time adopting other methods of dealing with ankylostomiasis, with the result that they have practically stamped out the disease; this successful outcome, however, cost them a lot of money, and for a time disorganized trade in some districts.

It is a matter of considerable importance to properly decide the direction of working when a coal seam has cleavage planes running through it. Such planes are commonly known as "face" and "butt." The question of safety is the first and most important consideration in determining the direction of working. If the bed contains many "slips" running parallel to the strike of the seam and on into the roof, it would be advisable to drive the face in an oblique direction, generally known as driving "half-on." This same direction of working is also most desirable in a soft seam with heavy top, for it gives the greatest percentage of round coal. In a hard seam, it is best to work the coal on the face so that the weight of the roof will assist in breaking down the cut and thus doing away with much shooting.

As the roof at the coal face of a long-wall working is partly supported by the timber, and partly by the coal itself, it is most important to arrange the props in such a manner that the coal has just sufficient weight thrown upon it to cause it to work easily. One authority states that at such a face, the packs should be built entirely of hard lumps, as large as can be obtained. It is also suggested that in such a case, the goaf be completely stowed; this enables the roof in the roadways and at the face to settle down gradually, and also prevents any large accumulation of gas, at the same time permitting the air current to be more easily conducted along the face.

At an English colliery, where considerable attention has been directed to the proper sanitation of the underground workings, the manager has erected closets near the pit bottom and near one of the principal roadways of the mine; it is purposed extending the accommodation which has already been provided, to other parts of the mine. Each closet is situated in a brick structure, provided with a wooden door, and consists of a galvanized iron pan containing coal dust placed underneath a wooden seat. Each closet is satisfactorily ventilated with an iron pipe placed over the pan and communicating with the return airway. The total cost of such a closet, including brickwork is less than $25. One of the stable men empty the pans about twice a week, by taking the contents to the surface. It is stated at this mine that such sanitary arrangements are not necessary at the working face.

The increase in accidents due to hang-fires only emphasizes the fact that at all mines, there should be a rule forbidding miners to return to the place before a certain prescribed time, say, one-half hour, has elapsed after the shots have been exploded. Many of these hang-fires are due to the flash of hot gases of one shot igniting the fuse of another which has been prepared at the same time, and which is intended to be fired immediately after. Others again, are due to the hemp of the fuse being left smoldering by an ineffectual attempt to ignite the core; the man already having lighted another shot is forced to leave the place, and in his absence the smoldering hemp fires the core. When the first shot has exploded, the man returns with the object of completing the task he thinks he has left undone, and is caught by the delayed explosion. Electric shot-firing largely eliminates hang-fires.

Few mine managers fully realize that "friction" is the important item to look after in the operation of a mine. In ordinary underground haulage, 50 per cent. of the energy developed is often expended in overcoming friction. It is in colliery ventilation, however, that frictional resistance becomes the all-important consideration, for in this work practically all of the energy applied is expended in overcoming friction. A full realization of this fact can best be obtained by remembering that, in mine ventilation, if friction were entirely absent, a difference of pressure equal to a water column one-quarter inch high (1.3 lb. per sq.ft.) would be sufficient to produce a movement in the air current equal to more than 2000 ft. per minute. To attain this velocity at a colliery with large well-kept airways, however, it would be necessary to have a pressure equal to a 7- or 8-in. water gage; this shows the necessity of devoting much attention to the elimination of avoidable friction.

Two of the most delicate tests for gas in a mine are known as the Pieler and the Clowes methods. The Pieler lamp burns alcohol and is similar to the Davy in construction. Air is admitted to this lamp through a tube which is protected by a wire gauze disk placed in the alcohol vessel in a vertical position. The Pieler lamp is a good gas tester, as it will plainly give a cap when less than ¼ per cent. of gas is present. The great difficulty with this lamp is that even a mild amount of heat causes the alcohol to take the form of a vapor, which latter is highly explosive when mixed with air. This lamp is also easily extinguished. The Clowes lamp burns hydrogen gas and shows the percentage of firedamp present by means of a scale on which the hight of "cap" is recorded. In the Clowes method of testing gas, an ordinary safety lamp may be used, providing it has a hole through the oil vessel. Through this hole a steel tube is inserted, and is connected to a steel cylinder on the outside of the lamp, the steel tube coming on a level with the oil flame. Inside the steel cylinder, compressed hydrogen is stored and is regulated by a screw valve. When about to test for gas, the hydrogen is turned on and becomes ignited by the oil flame; the latter is then turned out, and the hight of the hydrogen flame is regulated by adjusting the flow of hydrogen from the cylinder.

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Contents

PAGE

Editorials:
The Question of Prices..... 315
A Building for the Geological Survey 315
The Yukon Gold Company..... 315
The Steel Corporation in 1908..... 316
The Cost of Labor..... 316
Legislative Inquiry Concerning Cave-ins Over Anthracite Mines..... 316
*Ore Formation in the Wonder District, Nevada.....*Etienne A. Ritter* 289
Coking of Coal With Fine Ore at Cerro De Pasco..... 292
Magnesite in California.
Special Correspondence 292
*The Progress of Gold Mining in North Carolina.....*Edward West Lyon* 293
American Crude Oils..... 297
Trial of the Karns Tunneling Machine.
Special Correspondence 297
Gold and Silver in New Zealand..... 297
*Prevention of Accidents in Metal Mines.
Claude T. Rice 298
Drawback on Zinc Shavings.
Special Correspondence 302
*Mining Methods for Maximum Recovery of Coal.....*H. V. Hesse* 303
The Tennessee Copper Company in 1908.
B. Britton Gottsberger 309
The Question of Expert Evidence..... 309
Refusal to Adjust Prices, a Menace to Prosperity..... 310
*The Goldfield Consolidated Sampling Mill.....*John A. Church* 311
Courtland, Arizona, a New Copper Camp.
H. W. Chittenden 312
Transvaal Gold Mines..... 312
American Institute of Mining Engineers 313
A Novel Belt Conveyer..... 313
Colliery Notes..... 314
Correspondence and Discussion:
Electric Shocks and Fires in Mines.
Sydney F. Walker 317
Adair-Usher Process in Pachuca..... 317
Withdrawal of Western Phosphate Lands.
Charles Colcock Jones 317
The Milan Mine, New Hampshire..... 318
The Conservation Commission.
Special Correspondence 318
Operations of the Yukon Gold Company 319
Chronology of Mining, January, 1909... 320
Pig Iron and Steel in 1908..... 321
Balata Belts.....*Special Correspondence* 321
By-product Plant for the Frick Coke Company..... 321
The United States Steel Corporation... 322
Mineral Concessions in India..... 322
January Dividends..... 322
Australasian Gold Production..... 323
Saddle Reefs of Bendigo, Australia..... 323
New Stack of the Boston & Montana Company..... 323
Rhodesian Mines..... 323
Personals, Obituaries, Societies and Technical Schools..... 324
Special Correspondence..... 325
Mining News..... 327
Markets..... 332
Mining Index..... 338
Prices Current, Chemicals, Earths, Minerals, etc..... 344
Illustrated.

The Question of Prices

It is admitted that the commercial depression of 1907-09, as acute in Great Britain, Germany and elsewhere as in America, resulted from the world's living beyond its means, one of the concomitants of over-expansion and extravagance being the boosting of commodity prices. To regain the full measure of prosperity it is nesessary to practice economy, to accumulate savings. As *The Evening Post* remarked the other day, it may seem ridiculous to preach economy "to a country which is talking of an issue of $500,000,000 in bonds for the Panama canal, and habitually thinks in hundred millions, but it is the tiny savings that make the big loans possible."

But if the cost of labor and material continue so high as to check work that ought to be done; if men continue, therefore, to be out of employment; and if the cost of living is unameliorated—How are people going to save? Are they not rather bound further to diminish their accumulations?

The answer is in the negative if the theory of the trusts—both of capital and of labor—be correct. The trust magnates have reasoned that if the world will not now pay for their goods the price demanded, sooner or later it will have to do so. Diminished competition and command of vast credit have fortified them in this defiance of the law of supply and demand. Labor unionism, true to its fallacy that work is a boon to be distributed rather than a factor in the creation of wealth, has preferred to waste time rather than consent to a reduction of wages.

Since the nadir of 1908 there has been a betterment of conditions, to which many things bear testimony. The index numbers have been a little more favorable to revival of consumption, but after all they did not decline far below the zenith of 1907; nor did wages. Has it not been this very resistance to economic laws that has protracted the commercial depression? It is undeniable that now, close upon two years since the reverse began and 12 months since business was at lowest ebb, hopes have been disappointed.

In this country the Steel Corporation has been the leading exponent of the theory that reductions of prices were unwise and unnecessary. We have repeatedly argued against that fallacy, as have other journals. We understand that the directors of the Steel Corporation at last recognize among themselves that they were mistaken.

A Building for the Geological Survey

The Secretary of the Treasury has transmitted to Congress a communication from the Secretary of the Interior, urging the erection of a fireproof building for the Geological Survey and other bureaus of the Department of the Interior, and submitting an estimate of $2,500,000 as the probable cost of such a building as is required. We have previously pointed out the reason why the Geological Survey should have such a building. We hope that Congress will promptly grant the necessary appropriation.

It is perhaps modesty that inspires the Secretary of the Interior to ask for a building to be used by the Geological Survey, the General Land Office and the Office of Indian Affairs in combination. We think that the Geological Survey ought to have a building of its own. This should be a monumental building like the home of the geological survey of Mexico, which adorns the capital of our sister republic. The possession of such a building would be a fitting recognition of the high esteem with which the U. S. Geological Survey is held by the scientists of the world, and everyone concerned in the mining industry of the United States would be pleased.

The Yukon Gold Company

S. R. Guggenheim, president of this company, has issued to the stockholders a letter concerning the object of the enterprise, what has been accomplished and what is still to be done, estimated earnings, etc. His statement is frank and to the point, except that no data as to the operating costs are given. However, if he accepts the facts as stated, together with the estimate of the profits, the stockholder is able to form a fair idea as to the value of his property.

At the time of the Lawson flotation, the net profit of the developed ground was estimated at $36,000,000. It is now stated that $40,000,000 net is to be expected. The earnings in 1908 were about $550,000. In 1909 they are expected to be $1,100,000

to $1,500,000. In 1910 the net profit "should be from $2,000,000 to $2,500,000 and in 1911 and thereafter $2,500,000 net per annum should be the minimum."

This gives, for the first time, notice of the time that the management contemplates for the working out of the property, which apparently will be 16 to 20 years. This is in line with the analysis in the JOURNAL of April 18, 1908. Unfortunately, Mr. Guggenheim does not give any indication of what part of the estimated net profit will be applicable to the payment of dividends, and what part must go back into the property for maintenance. Perhaps he means that it will all be available for dividends. There is always a vagueness about the term "net profits." In the case of the Yukon Gold Company it might have been dissipated if Mr. Guggenheim had gone into the matter of gross yield and operating expense.

The discredit arising from the Lawson connection has deprived this company of the recognition to which it is entitled. Mr. Guggenheim's letter appears to be inspired in part by the desire to correct the false impression. The company is, indeed, engaged in a great industrial undertaking. Some extraordinary engineering feats have been accomplished and the introduction of new methods marks an era in Alaska placer mining. To O. B. Perry, the managing engineer of the company, is chiefly due the credit for this.

The Steel Corporation in 1908

The United States Steel Corporation in 1908 passed through the worst period of depression it has encountered since its first organization. This period followed the best year in its history, and the contrast was much greater than that between 1903 and 1904. It is true that through its influence and diplomacy it was successful in some degree in preventing the fall of prices which has marked previous years of depression; but it is a question whether the business which might have been secured by concessions would not have put the company into better condition than it occupies at present.

Speaking briefly of the results of the year, the net earnings over operating expenses were $69,138,154 less than in 1907, and were smaller than those of any year since 1904. They were sufficient, however, to meet all the fixed charges and the dividends on the preferred stock, and also to continue the 2 per cent. which the company has for several years paid on the common stock. This was done by cutting down the depreciation and renewal charges to the lowest possible point, and by omitting all appropriations for new work and construction. These had been on a liberal scale for three years, and in 1906 and 1907 had amounted to the great sum of $57,500,000 in each year. That the maintenance of dividends was possible in a year when the net earnings fell off 43 per cent., is an evidence of the large profits earned in the boom years.

The monthly earnings in the latter part of 1907 showed the sharpest fall on record, decreasing from a maximum of $17,052,211 in October to $5,014,728, or less than one-third of the former amount in December. This fall was not without warning, however, for the tonnage of unfilled orders, as reported at the end of each quarter, began to fall off early in the year, and continued to decline steadily. In 1908 the monthly earnings began to improve from January on, but the advance was very slow, though in December the net earnings were $3,000,000 above those of January.

What the effect on the revival of business might have been had the Steel Corporation encouraged construction and investment by a general reduction in prices, has been heretofore discussed. There can be no doubt that such a course would have hastened the recovery of trade. It appears now the managers have at last seen their mistake, and are prepared to try the opposite course, so that price reductions may be expected.

The Cost of Labor

The Ways and Means Committee of the House of Representatives, which is engaged in drafting a new tariff bill, appears to be profoundly concerned as to the lower rates of wages in foreign countries. This is to a large extent a waste of thought. Modern economists seem to be fairly well agreed that differences in the wage rate cut comparatively little figure. It may be stated as a general rule, to which, of course, there are some exceptions, qualifications and limitations, that the laborer is worthy of his hire. Where labor is low the performance per man is generally correspondingly low.

Legislative Inquiry Concerning Cave-ins over Anthracite Mines

The question of responsibility for cave-ins of the surface over anthracite mines, where damage to property has resulted, has been a constant litigation in the mining districts of eastern Pennsylvania. The towns in the anthracite region are almost without exception underlaid by seams of workable anthracite coal. The increasing value of this product, combined with the depletion of the easily accessible beds, has caused the larger anthracite companies to mine as much coal from beneath the towns as can be obtained without injuring the surface. In many instances, however, the limit of safety has been exceeded, with the result that buildings on the surface have been wrecked.

In answer to a petition submitted by the mayors of five cities and the burgesses of 13 towns, Governor Stuart has just sent a special message to the General Assembly recommending the creation of a commission with authority to inquire into the subject and make a report to the next legislature.

The work of the commission will be important; however, it will face a problem that has already been solved in European countries. Some anthracite operators have indeed anticipated such action, and have introduced flushing systems, whereby the worked-out portions of their mines are filled with culm and waste material, thus permitting the extraction of all pillars, without injury to the surface. This system adds somewhat to the cost of the coal produced, but insures a greater recovery.

There is no reason why many square miles of surface in the anthracite region should be made insecure, if not worthless, by the refusal of a few mine operators to adopt methods that have already been tried and proved successful.

WHILE THE FEDERAL GOVERNMENT is concerning itself so much as to conservation of resources and the reduction of waste, why does it not begin with itself and eliminate some of the scandalous wastes that go on in the administration of its own affairs?

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Electric Shocks and Fires in Mines

The article on "The Use of Electricity in Australian Collieries" in the JOURNAL of Nov. 14, 1908, is exceedingly interesting. The troubles Selwyn Brown points out as having been experienced in Australian mines, are exactly those that have been experienced in English mines. There has been the same trouble with the exposure of live metal, and from the deterioration of the insulation of cables, and from cables being stripped.

I venture to think, however, that the workmen of New South Wales, and the New South Wales government, are wrong in endeavoring to keep the pressure employed at a very low figure. If the pressure is kept at a figure which is safe under all circumstances, it will render the use of electricity in mines absolutely prohibitive, on account of the enormous cost of the cables. In one case which passed through my hands, the difference between employing 2000 volts, and 500 volts, for cables alone, I estimated at $30,000.

On the other hand, once the limit of safe voltage is passed, there is no reason why as high voltages as the management chooses, within very wide limits, should not be employed. About 140 volts in alternating current kills, and about 400 volts in continuous currents. Once those pressures are exceeded, the danger is practically the same for all pressures, so far as the men about the mine are concerned, until rather high voltages are reached, and then the paradox arises, that, owing to the burning effect of the arc which is almost invariably produced when a man touches a very high pressure conductor, greater safety is enjoyed than with pressures just above the limit.

SOURCES OF DANGER

The great danger from shock in mines arises from conductors' being stripped of their insulation, and making connection with some other innocent-looking metals. A stripped conductor may transmit the ability to give shock, to some metal at a considerable distance from it, that is not actually in contact with it, but which is in contact with a second piece of metal, or even a third, the second or the third being in contact with the live conductor. A girder has accidentally stripped the covering of an insulator, and has killed a man handling it. The insulating envelop of the flexible cable carrying current to a coal cutter has been punctured, and the man moving the haulage rope has been killed. Naked galvanized-iron wires employed for signaling, have been rendered "live" by one or two connections, and have killed men touching them. The remedy for all is the provision of very good insulation, and as much of it as funds will allow, in the first instance, and its careful maintenance after.

Fires have unfortunately been caused in not a few cases, in mines, by the arc that has been formed between a pair of broken conductors, or between one of them and the rails, when coal dust has been present in a position to be ignited. The continuous current arc is far more liable to cause fires than an alternating current, and the danger of the arc's causing fire increases with the pressure.

SYDNEY F. WALKER.

Bath, England, Dec. 4, 1908.

Adair-Usher Process in Pachuca

In the JOURNAL of Sept. 5 and 19, 1908, there is a reference to the so-called failure of the Adair-Usher process at Pachuca, Mexico, where it had been installed by the Blaisdell company for trial under working conditions.

It was never contemplated by us that this process would be applied to anything but slimes, and we should certainly have endeavored to stop its use under the conditions prevailing at Pachuca had we known that mining as practiced in Mexico had not reached the stage of complete separation of sand and slimes as performed here on the Rand.

The presence of large quantities of silver or any other metal in the ore, provided it is amenable to cyanide or any other lixiviating treatment is no detriment at all to the process, as we presume that cyanide managers in America endeavor by some means, such as circulation or agitation to get the gold and silver completely dissolved, or as nearly so as possible, before washing is commenced.

We inclose a list of the mines on which our process has been successfully worked on the Rand, and we are convinced that under similar conditions in other countries the process can be worked with equally good results.

BALL & STUART, Secretaries,
Adair-Usher Process, Ltd.

Johannesburg, Transvaal, Dec. 14, 1908.

[From the statements received with this letter it appears that the Adair-Usher process has at six different mines effected reductions in the losses in the tailings varying from 5d. to 8s. At the Crown Reef, where 8000 tons per month were subjected to the process, the time of treatment was reduced from 5 days 8 hours to 3 days and 14 hours. At the New West Bonanza the gold in the tailings was reduced from 2.50 to 0.75 dwt. per ton.

The process is either in successful use, or in course of installation at plants of the following mines and companies: Crown Reef, Geldenhuis Estate, Treasury, Geldenhuis Deep, Worcester Exploration, Geldenhuis Main Reef Tributors, West Rand Mines Slimes Tributors, New Heriot, Cinderella Deep, Robinson Randfontein, Champ d'Or, Durban Roodepoort, Ferreira, Transvaal, Jumpers, New West Bonanza, Durban Roodepoort Tributors, Burnham Slimes Tributors, Nigel, West Rand Mines, Langlaagte Estate, Tributors Molyneux Gold Mines, Ginsberg, Blaisdell & Co., Consolidated Main Reef and Estate, Glynn's Lydenburg, Jubilee, Paarl Central Slimes Tributors, Nourse Mines, Salisbury.—EDITOR.]

Withdrawal of Western Phosphate Lands

The remarks in the JOURNAL of Dec. 19 on this subject coincide fully with my own views. The stand taken is good, sound Americanism, however little it may agree with the views of certain exploiters of American resources for foreign profit.

In the light of the present withdrawal of phosphate lands I believe the letters which I inclose may be of interest as being the first suggestion along that line. President Roosevelt by this far-reaching decision has done an incalculable service to the American nation, and if it were feasible to follow this up and render the exportation of phosphate prohibitive, notwithstanding present curses from certain quarters, future generations would arise and call him blessed.

The JOURNAL did me the honor in May, 1907, to publish the first article that appeared concerning the Western phosphates. About the same time the subject was treated by the U. S. Geological Survey in "Contributions to Economic Geology for 1906, Part 1," in which almost

the opening sentence it spoke of the business to be built up possibly in supplying Australia and Japan. Fortunately recent discoveries in the Pacific islands do not now make that feature of the business so attractive, and I thoroughly agree with the JOURNAL that American phosphate deposits should be conserved for the American people.

If now, while the western business is in its infancy, a fair plan can be evolved whereby the United States can recover title to the deposits already located and patented it would seem the logical sequence to the present withdrawal of phosphate lands.

It might be accomplished by 50-year leases with the fixed royalties to be an offset against the present actual cost of the properties to the different companies and individuals until these costs had been extinguished and they had been reimbursed through that source, after which the royalties to become payable to the Government. Some such plan could be made equitable to all parties and finally place in the hands of the Government this veritable backbone of the nation.

CHARLES COLCOCK JONES.

Los Angeles, Cal., Dec. 24, 1908.

[The correspondence referred to in Mr. Jones' letter is too voluminous for publication in these columns. A letter dated Oct. 16, 1906, and addressed to President Roosevelt, urges the withdrawal of the phosphate lands from mineral entry, and one from H. C. Rizer, acting director of the U. S. Geological Survey, dated Nov. 1, 1906, recognizes the force of Mr. Jones' suggestion and requests further information on the subject.—EDITOR.]

The Milan Mine, New Hampshire

George A. Packard is in error in stating in his article in the JOURNAL of Jan. 9, 1909, that the Milan mine in 1908 shipped several carloads of ore said to run 5 per cent. copper and as high as 50 per cent. silica. The fact is that we shipped to the American Smelting and Refining Company two trial carloads of ore which showed the following analysis: Copper, 8 per cent.; silica, 7.8; sulphur, 38.18; iron, 31.83; gold, 0.08 oz. and silver, 4 oz. per ton. Subsequent to this, we shipped in 1908 nine schooner-loads of ore which averaged from $8 to $10 per ton in metallic contents at the smelter. We expect in a short time to have our new milling and ore-dressing plant in operation.

J. B. CARPER, President and Manager,
Milan Mining and Milling Company.

Jan. 15, 1909.

An average of 2338 machine drills were in operation during the first six months of 1908 at the mines on the Rand, South Africa.

The Conservation Commission

SPECIAL CORRESPONDENCE

The next forward step in the conservation movement has been taken by Chairman Pinchot in transmitting to President Roosevelt the report of the National Conference on Conservation, accompanied by the complete text of the proceedings of the conference. President Roosevelt has sent the report to Congress (Jan. 22) with a message urging certain important legislative acts. Simultaneously with this step, Mr. Pinchot has announced the personnel of the joint committee which is to represent the States and the Federal Government in making plans for the development of a conservation policy. Six of its members are chairmen of State conservation commissions, and three are members of the national conservation commission, besides the chairman and secretary of the national body. The membership of the committee is as follows: Representing the State conservation commissions: J. N. Teal, Portland, Ore.; Paris Gibson, Great Falls, Mont.; W. K. Kavanaugh, St. Louis, Mo.; W. H. Milton, Marianna, Fla.; Prof. Frank W. Rane, Boston, Mass.; O. J. Salisbury, Salt Lake City, Utah. Representing the national conservation commission, Knute Nelson, Alexandria, Minn.; Newton C. Blanchard, Shreveport, La.; George C. Pardee, Oakland, Cal. Gifford Pinchot is chairman, and Thomas R. Shipp, secretary. These men were selected with a view to having all sections of the country represented on the "Joint Committee on Coöperation," as it will in future be known. All have taken an active part in the conservation movement, and are said to be thoroughly familiar with the situation in their own districts.

President Roosevelt in his message speaks of the report of the commission as "one of the most fundamentally important documents ever laid before the American people." He says that "the facts set forth in this report constitute an imperative call to action and adds "with the statements and conclusions of this report I heartily concur." The President recommends the organization of efficient fire patrols and the enactment of good fire laws by the States, while he indicates the necessity of such a reformation of State taxation as will permit the perpetuation of existing forests. As to lands he thinks that the remaining public lands should be classified, the arable lands disposed of to home-makers, the timber and stone act and the commutation clause of the homestead act be repealed and the desert-land law be modified in accordance with the recommendations of the public-lands commission. He further suggests that the use of the public grazing lands be regulated, while "rights to the surface of the public land should be separated from rights to forests upon it and to minerals beneath it, and these should be subject to separate disposal." Also "the coal, oil, gas, and phosphate rights still remaining with the Government should be withdrawn from entry and leased under conditions favorable for economic development." In dealing with the subject of minerals, Mr. Roosevelt, accepting the estimates of the conservation commission, reckons the present mineral waste at about one-sixth of the product. The President further points out that mineral resources are limited in quantity and that the supply will shortly be exhausted unless better methods are devised or substitutes are found. Further investigation, he thinks, is urgently needed in order to improve methods and to develop and apply substitutes. He then adds: "It is of the utmost importance that the bureau of mines be established in accordance with the pending bill to reduce the loss of life in mines and the waste of mineral resources and to investigate the methods and substitutes for prolonging the duration of our mineral supplies. Both the need and the public demand for such a bureau are rapidly becoming more urgent. It should coöperate with the States in supplying data to serve as a basis for State mine regulations."

The report of the conservation commission as transmitted by the President covers ground already dealt with in this correspondence. A few important changes have, however, been introduced into the inventory of natural resources, some figures being modified and certain additions made. The report in dealing with minerals takes the view that while waste is still very great, there has been progress in ascertaining methods of economy. This is particularly true in the case of coal, the present mine waste averaging little more than half the amount saved, and the chief waste occurring in connection with imperfect combustion. It is pointed out that the uses of all the mineral resources are interdependent and that this is particularly true of coal and iron. Special stress is laid on the necessity of protecting phosphate rocks used for fertilizers, inasmuch as the original supply cannot long withstand the increasing demand. A plea is also made for the saving of fire losses which are said to have approximated $450,000,000, or one-half the cost of construction in 1907. Of lands it is generally claimed that the present public land laws do not serve the interests of the nation, and that they should be reclassified and mineral rights disposed of separately from the lands themselves under a lease system. The usual recommendations with reference to forestry and water power are made, and in conclusion it is argued that the conservation of resources is an immediate and vital concern. "The pressing need is for a general plan under which citizens, States, and nation may unite in an effort to achieve this great end."

Operations of the Yukon Gold Company

The following letter to the stockholders of the Yukon Gold Company was issued by President S. R. Guggenheim on Jan. 30, 1909:

In submitting for your consideration a résumé of the company's mining operations, construction work, and plans for further equipment, I desire to call your attention to the magnitude of the undertaking in the Klondike district, Yukon Territory; what has been accomplished thus far, and what we expect to accomplish within the next two years.

At the time our engineers made their first examination in 1905, the famous placer fields of the Yukon were fast becoming depleted of their rich ground; the volume of gravel workable at a profit by hand method was rapidly being reduced, and the cost of working, under the most approved methods then in vogue, precluded the extension of the operations to take in the large bodies of lower-grade material.

The principal factors making toward the high cost were:

(1) The disconnected nature of the holdings (the claims being not over 500 ft. in length and owned largely by individuals), which reduced the workings to a number of small-scale operations, and prevented systematic mining upon any larger scale.

(2) The scarcity of water. The miners, both those working upon the creek levels and those upon the bench and hill deposits, were entirely dependent upon the rain-fall for their supply of water. As the snow and rain-fall is very irregular in the Klondike district, a corresponding irregularity entered into the mining operations, with a consequent increase in cost. No large scale hydraulic operations were possible with such limited and intermittent water supply.

(3) The high cost of fuel, labor and supplies. Wood fuel is available in the Klondike for mining purposes, but its cost is high and constantly increasing. Coal is to be had, but it is as expensive as wood. Labor is high, due to the short season for outside work, and supplies expensive because of high transportation charges, and the small and irregular character of the purchases.

Basis of the Enterprise

Our investment in the Yukon was based upon three fundamental hypotheses:

(1) That we would be able to acquire large and connected blocks of ground for systematic working.

(2) That we would be able to secure and make available at sufficient elevation a continuous water supply.

(3) That we would proceed to equip the properties with the most modern mechanical appliances, such as dredges and elevators, for handling the gravels upon a large scale and at a low cost, depending for power not upon local fuel, but upon electrical energy generated in our own hydro-electric plant.

All of these things have been accomplished. At the present time our holdings amount to about 90 per cent. of the claims located on the hills and creek bottoms of Bonanza, Bear, Hunker, and El Dorado valleys, which were wanted for the enterprise. These properties have been acquired mainly by outright purchase, although in some cases, where unacquired claims adjoin the properties of this company, advantageous working agreements have been made with the owners.

Early in 1906 construction was begun upon a water system which will insure to the Klondike a continuous water supply for all time. This was in itself a tremendous undertaking, involving the diversion of Tombstone river (the main right fork of the Twelvemile), carrying it a distance of about 62 miles by flume, ditch and pipe lines, through a country which was an absolute wilderness when our engineers first went upon the ground. In its course the main ditch follows the contour of the country, which, due to its rugged and partly frozen character, required miles of continuous flume construction. The line crosses five depressions, making an aggregate of nearly 12 miles of pipe line. The ditched sections, aggregating 37 miles, required the use of seven steam shovels in excavation, and the employment of more than 1000 men throughout three summers. The water is carried across the wide Klondike valley in an inverted siphon, which for length, size and pressure involved, is not, so far as we know, equalled in the world.

Construction

The construction of this water system was carried on in the face of great difficulties. It involved the distribution of thousands of tons of supplies and construction material; the manufacture, distribution and use of more than 8,000,000 ft. of lumber, produced by our own logging and sawmill operations; the hauling over winter roads; and distribution of several thousand tons of steel and wood-pipe line; and its installation at an average distance of 35 miles from the base of supplies.

In the construction of the flume, ditch and pipe line, innumerable engineering difficulties were encountered and overcome, which would not be met anywhere, except in the far northern country. The complete work today is evidence of persistent and untiring effort upon the part of the men in charge. Many of the engineering feats accomplished have prompted praise from the technical press. They mark an era in Alaska mining history.

Simultaneously with the construction of the water system, a hydroelectric power plant was installed on the Little Twelvemile river, capable of delivering 2000 h.p., which is transmitted to the placer fields by a high-tension line, 36 miles straight across country, with three substations and 18 miles of secondary line.

A huge dam has been built at the head of Bonanza creek to conserve the water of the Upper Bonanza watershed for use upon the company's Bonanza and El Dorado Creek properties.

Equipment plans have been caried forward in a manner to evoke enthusiasm and inspire confidence in a speedy consummation of the enterprise as a whole. Seven dredges have been erected, the last of which was completed and put in operation late in the season of 1908. These dredges are of large capacity and great strength, able to withstand the most severe service. Their operation in the latter part of 1908 demonstrated the entire success of this method of mining, as applied to the gravels of the Yukon. The difficulties due to frozen ground have been overcome within the limit of a reasonable working cost, and this cost will, without doubt, be greatly reduced when the main water supply is available for stripping the gravels in advance of the dredges.

Three mechanical elevators were installed, two of which were put into operation during the season of 1908. It is a great pleasure to say that the mechanical elevators, electrically driven, which were designed by our own engineers and used here for the first time in any country, were entirely successful. They will be presently operating upon the ground from which the gold could not be thoroughly extracted by any other method of mining known to us. The successful operation of the elevators solves one of the most difficult problems in connection with our Yukon business—that of handling flat, shallow gravels, largely frozen, where the bedrock is rough and irregular and the gold extends to some depth into the crevices.

Since acquiring the properties in the Yukon, we have carried on hydraulicking to a limited extent, and dependent upon the local intermittent water supply. The operations have shown a profit, and have proved not only the value of the gravel, but also that a very low working cost can be reached.

In the season of 1909 we expect to have the equipment working up to at least one-half of its ultimate capacity. In the season of 1910 we fully expect to show a production which will make the Yukon Gold Company take rank as one of the largest gold mines in the world.

Holdings and Proved Ground

We have only proved our holdings in part, first, because of the advisability of concentrating our engineering staff upon the installation of the present equipment, and second, because of the expense attendant upon the thorough prospecting of

ground in the north. Our engineers having reported that we now have nearly $40,000,000 net in proved ground, which is approximately 100 per cent. profit on the shares at par, and provides for many years' dividends, we concluded to postpone further prospecting of our holdings, until our present plant and equipment are running to full capacity. There is good reason to believe that additional workable ground will be developed and economies introduced which will greatly increase the ultimate net profit.

The shareholders will be interested to know that a large majority of the outstanding capital stock of the Yukon Gold Company is owned by the Guggenheim Exploration Company, whose engineers have under their direction the equipment and operation of the properties. The Guggenheim Exploration Company has financed the scheme from its inception, justifying its investment by the conclusions of its engineers after rigid examination and exhaustive reports. That the members of the company are satisfied with their investment is evidenced by the fact that they have not disposed of a share of their holdings. The fact is that the directors of the Guggenheim Exploration Company feel that they, as pioneers in the industrial development of the North, have taken the first steps toward the establishment of a permanent and substantial mining industry in the Yukon Territory and Alaska. The day of the small operator had come and gone, and in his place entered the corporation, to do the things which few individuals, having the means, would care to undertake; that is, to supply sufficient capital for the development of the resources of the country and make its mining future definitely assured. It required courage to make such an investment, running well up into millions of dollars, but the directors feel that the money and time they have expended in developing the resources of the North, will ultimately result in a large profit to the stockholders of the first company to go into placer mining in this region upon so gigantic a scale. That others will follow in our footsteps we hope and have no doubt, now that we have demonstrated that the frozen gravels can be worked within reasonable operating cost, and in fact that all of the handicaps under which the individual operator labored can be overcome. We feel safe in predicting, therefore, for the future, an immense increase in the gold output of Alaska and the Yukon Territory which naturally will be attended by improvement in local conditions and increasing prosperity.

Past Results

For the last season final results have not as yet been actually determined, but incomplete figures show that the net earnings to Dec. 31, 1908, will be about $550,000. Without doubt, we should have reached our estimated net of $800,000, had it not been for delay in delivery at Dawson of machinery, which was held up at Whitehorse by unusually low water in the Yukon river immediately after the opening of navigation. This delay cut the length of our season materially, but possibility of repetition may be omitted from future calculations, now that our equipment has been delivered and installed.

Our engineers have estimated the probable earnings for 1909 at from $1,100,000 to $1,500,000. The wide difference in these figures is due to the unknown factors entering into the water supply, and the uncertainties attendant upon the first operation of a new ditch line of such length, and constructed under such difficulties. If we have comparatively few washouts or accidents on the main ditch system or the equipment, our earnings will probably reach the higher figure.

In 1910 the net profits of the company should be from $2,000,000 to $2,500,000, and in 1911 and thereafter, $2,500,000 net per annum should be the minimum.

I have no doubt that the directors will authorize the commencement of dividends during this year, probably in the second quarter; but before deciding definitely as to the date and rate, they deem it prudent to wait until the coming season's operations have sufficiently advanced to enable them to estimate more accurately the probable earnings for 1909.

Chronology of Mining, January, 1909

Jan. 2—General strike of miners in New Zealand on account of Workers' Compensation Act, effective Jan. 1, requiring medical examination for certain diseases.

Jan. 4—Strike of miners at Broken Hill, N. S. W.

Jan. 5—Outside steel makers reduced prices.

Jan. 6—J. W. Gates in letter to Ways and Means Committee advocated duty-free iron ore, coal and lumber and reduction in duty on iron and steel. Tennessee Steel Company incorporated in Maine with $20,000,000 capital stock. Pueblo Indians attacked miners of the American Turquoise Company, New Mexico.

Jan. 7—U. S. Steel Corporation offers common stock to employees at 50, besides the usual offer of preferred at 110, this being held to imply increased confidence in the common stock. Senator Culberson accuses President Roosevelt of violating law in Tennessee-Steel Trust deal.

Jan. 8—Concentrator of Arizona Copper Company, Clifton, destroyed by fire. Manufacturers of lead products petitioned Ways and Means Committee for duty-free pig lead and for duty on manufactures.

Jan. 9—Statistical number of the Journal gave world's mineral production for 1908.

Jan. 10—Explosion in Leiter mine, Zeigler, Ill., killed 27 men.

Jan. 12—Organization of Copper Producers' Association to report monthly production and stock of refined copper. Announcement that Cole and Ryan had secured control of Giroux Consolidated Mines Company. Explosion at Lick Branch colliery at Switchback, W. Va., killed more than 105 men. Earthquake on Pacific coast. Goldfield Consolidated mill began dropping 100 stamps.

Jan. 13—Explosion of gas at Almassy mine, Resicza, Hungary, killed 12 men.

Jan. 14—Explosion of gas, followed by a dust explosion, at Aika colliery, Veszprem, Hungary, killed 56 men.

Jan. 19—U. S. Circuit Court of Appeals affirms decisions of Circuit Court and Board of General Appraisers that zinc ore is not dutiable under the Dingley Act.

Jan. 22—The President, in a message to Congress on the conservation of resources, recommended that the coal, oil, gas and phosphate rights still remaining with the Government be withdrawn from entry and leased under conditions favorable for economic development. Flood on the Rand, Transvaal, broke dam and flooded a mine, drowning 160 miners. Kelvin-Calumet copper properties acquired by Ray Consolidated Company, a $5,000,000 corporation.

Jan. 24—Judge Hunt, in the Federal Court, Helena, Mont., gave a decision against the farmers in the Washoe smelter fume case, refusing the injunction asked for. Shutdowns of all the mines at Globe, Ariz., because of labor agitation.

Jan. 26—U. S. Steel Corporation quarterly report showed gain in unfilled orders.

Jan. 27—Reports multiply of price cutting by independent steel manufacturers. Explosion in Merchants coal mine of the United Coal Company, Boswell, Penn., killed five men.

Jan. 28—Copper River Railroad, Alaska, completed from Condova to Abercrombie rapids. Fire in Sutro tunnel, Comstock lode, caused minor damages.

Jan. 29—Senate begins taking testimony respecting Tennessee-Steel Trust deal. Resumption of work at Globe, Ariz.

Correction

In the article "Examining and Fitting up a Hydraulic Mine" by H. A. Brigham in the Journal of Jan. 2, 1909, the last sentence of the fourth paragraph from the bottom of page 27 was transposed. It should be the last sentence in the next paragraph which should read: "A giant under heavy pressure, placed at the lower end of the sluice, may be used to great advantage in stacking or elevating the tailings whenever the dump room is ample in area but deficient in grade. Any boulders, stumps, etc., that will run through the sluice, can be elevated by this process equally as well as the fine gravel."

Pig Iron and Steel in 1908

The completed figures for the production of pig iron and bessemer steel, as collected by the American Iron and Steel Association, are now available for 1908, and show the sharpest decrease in that year which has ever been reported. The pig iron make fell back almost to that of 1907 and was only about two-thirds of that reported in the previous year.

Pig Iron

The American Iron and Steel Association has received from the manufacturers complete statistics of the production of all kinds of pig iron in the United States in 1908. The figures, as given in the *Bulletin* of the association show the total production for two years as below, in long tons:

	1907.	1908.	Changes.
First-half	13,478,044	6,918,004	D. 6,560,040
Second-half	12,303,317	9,018,014	D. 3,285,303
Total	25,781,361	15,936,018	D. 9,845,343

The second half of 1908 showed an increase of 2,100,010 tons over the first half; the total decrease for the year being 38.1 per cent. The division of the make according to the fuel used was as follows:

	1907 Tons.	1907 PerCt.	1908 Tons.	1908 PerCt.
Coke	23,972,410	93.0	15,331,863	96.2
Anthracite	1,371,554	5.3	355,009	2.3
Charcoal	437,397	1.7	249,146	1.5
Total	25,781,361	100.0	15,936,018	100.0

Very little iron is made with raw bituminous coal, and that is included with the coke iron. Nearly all the anthracite furnaces use some coke also, the quantity made with anthracite alone having been only 36,268 tons in 1907, and 1694 in 1908. A small quantity of iron was made experimentally in Michigan with producer gas as fuel; and a small quantity was made, also experimentally, in the electric furnace.

Division of Product

The more important division according to the purposes for which the iron was intended is as follows:

	1907 Tons.	1907 PerCt.	1908 Tons.	1908 PerCt.
Foundry & forge	6,397,777	24.8	4,307,734	27.0
Bessemer pig	13,231,620	51.3	7,216,976	45.3
Basic pig	5,375,219	20.9	4,010,144	25.2
Charcoal iron	437,397	1.7	249,146	1.5
Spiegel and ferro	339,348	1.3	152,018	1.0
Total	25,781,361	100.0	15,936,018	100.0

The bessemer pig in 1908 included 130,616 tons of special low phosphorus iron. The spiegel and ferro included 152,018 tons spiegeleisen and 40,642 tons ferromanganese; besides a few hundred tons of ferrophosphorus.

Active Furnaces

The whole number of furnaces in blast on Dec. 31, 1908, was 236, against 168 on June 30, 1908, and 167 on Dec. 31, 1907. The number of furnaces in blast at the end of 1907 was smaller than at the close of any year since 1896, when but 169 furnaces were active. At the close of 1908 there were 223 idle furnaces, as compared with 276 idle furnaces at the opening of the year.

Production by States

The production by States for two years past was as follows:

States.	1907.	1908.
Mass. and Connecticut	19,119	13,794
New York	1,659,752	1,019,495
New Jersey	373,189	225,372
Pennsylvania	11,348,549	6,987,191
Maryland	411,833	183,502
Virginia	478,771	320,458
Georgia and Texas	55,825	24,345
Alabama	1,686,674	1,397,014
West Virginia	291,066	65,551
Kentucky	127,946	45,096
Tennessee	393,106	290,826
Ohio	5,250,687	2,861,325
Illinois	2,457,768	1,691,944
Indiana and Michigan	436,507	348,096
Wisconsin and Minnesota	322,083	148,938
Missouri, Colorado, Washington and California	468,486	313,071
Total	25,781,361	15,936,018

The smallest proportional losses shown in 1908 were in Tennessee and Alabama.

Bessemer Steel Production

The decline in bessemer steel was even greater proportionally than that in pig iron, being 47.5 per cent. In part this was due to the increased use of open-hearth steel, which has been so much in evidence for several years past. The production by States was as follows, in long tons:

	1907.	1908.	Changes.
Pennsylvania	4,351,841	2,106,382	D. 2,245,459
Ohio	3,636,679	1,955,446	D. 1,681,233
Illinois	1,723,073	1,237,747	D. 485,326
Other states	1,955,956	817,180	D. 1,138,776
Total	11,667,549	6,116,755	D. 5,550,794

The totals include castings made direct from the converter, which were 33,273 tons in 1907, and 20,559 in 1908. The total production of bessemer steel was the smallest reported since 1897, when 5,475,315 tons were made. The maximum output was in 1906, when the total reached 12,275,830 tons, or a little more than double the make of last year. The largest proportional decrease was in Pennsylvania. This was probably due to the substitution of open-hearth furnaces for bessemer converters by the Carnegie works.

The figures for open-hearth steel are not yet available; but the indications are that the open-hearth was greater than the converter make last year.

Rail Production

The production of all kinds of rails for two years past was, in long tons:

	1907.	1908.	Changes.
Bessemer steel	3,380,025	1,354,236	D. 2,025,789
Open-hearth steel	252,704	567,304	I. 314,600
Iron	925	71	D. 854
Total	3,633,654	1,921,611	D. 1,712,043

This includes all classes of rails, rerolled, as well as those made from new steel. The rerolled rails were about 71,000 tons. The production of bessemer-steel rails was the smallest reported since 1896. The output of open-hearth steel rails was more than doubled, which is one result of the sharp controversy over bessemer-steel rails, which has been going on for the past two years. The open-hearth rails were made chiefly by the Bethlehem Steel Company and the Tennessee Coal, Iron and Railroad Company.

The following table gives the production of all kinds of rails, according to the weight of the rails per yard. Street and trolley rails are included:

Section:	1907.	1908.	Changes.
Under 45 lb	295,898	183,869	D. 111,969
45 to 85 lb	1,569,985	688,198	D. 881,787
Over 85 lb	1,767,831	1,049,544	D. 718,287
Total	3,633,654	1,921,611	D. 1,712,043

The total decrease in 1908 was 47.1 per cent. The greatest proportional decrease was in rails between 45-lb. and 85-lb. section; the smallest was in light rails, under 45-lb. section.

Exports of rails decreased from 338,906 tons in 1907 to 196,510 in 1908; a reduction of 142,396 tons, or 42 per cent. This was slightly less than the decrease in production, but does not indicate that export trade made up in any appreciable degree for the decline in home demand.

Balata Belts

Special Correspondence

Balata belts have been manufactured in Scotland for the last 20 years, and while they have been extensively used in South Africa, Australia and Europe, their use in the United States is of a comparatively recent date. The Robins New Conveyer Company is now introducing them in this country. The basis of the belt is a closely woven cotton duck, and balata which is a gum, is applied in a hot liquid form, thereby saturating the plies of duck. The gum is used in an unadulterated form, without mineral or other ingredients. Balata belts are recommended for conveying and transmission purposes in damp and exposed places. In South Africa they have been widely used for carrying ore to the stamp mills.

By-product Plant for the Frick Coke Company

Reports from Pittsburg state that the Frick Coke Company has abandoned work which was to cost $3,700,000 on 1700 additional coke ovens at Uniontown, Penn., and will substitute for the proposed bee-hive ovens an enormous by-product coke plant at Gary, Ind. The abandonment of the projected 7000 bee-hive ovens at Filbert, 5000 at Ralph and 500 at Sarah, means that the Frick plants in those localities will hereafter be merely coal-loading plants.

The United States Steel Corporation

The publication of the earnings of the December quarter of 1908 makes it possible to give a summary of the operations of the United States Steel Corporation for the full year 1908; subject only to some slight corrections which the complete report may make. As compared with 1907 the net earnings show a decrease of $69,138,154, or 42.9 per cent. The corporation was able to pay its usual dividends, notwithstanding this heavy decrease, by cutting off the appropriations for new work and improvements which had been made on a liberal scale in the two or three preceding years.

The income accounts for two years past can be compared as follows:

	1907.	1908.
Net earnings	$160,964,674	$91,826,520
Sinking funds	$7,115,258	$6,361,668
Depreciation and reserve	22,241,983	15,396,121
Interest	22,860,355	23,862,649
Adjustments	681,515	.....
Total charges	$52,899,121	$45,620,438
Balance	$108,065,563	$46,206,082
Add adjustments	.....	289,183
Total net	$108,065,563	$46,495,265
Special improvements	3,500,000	.....
New construction	54,000,000	.....
Dividends	35,385,726	$35,385,726
Total appropriations	$92,885,726	$35,385,726
Undivided surplus	$15,179,837	$11,109,539

The dividends declared were the same in both years; 7 per cent., or $25,219,676 on preferred, and 2 per cent., or $10,166,050, or common stock.

The gross receipts, which were $757,014,768 in 1907, have not yet been stated for 1908. The net earnings, as published, "were arrived at after deducting each month the cost of ordinary repairs and maintenance of plants, employees' bonus funds and interest on bonds and fixed charges of subsidiary companies." These net earnings, by months, were as follows in 1908:

Jan.	$5,052,743	July	$8,599,630
Feb.	5,709,428	Aug	9,152,311
March	7,466,834	Sept	9,354,333
April	6,761,680	Oct	9,415,668
May	6,021,279	Nov	8,756,729
June	7,482,797	Dec	8,053,088

The monthly earnings showed a fair recovery from January to March, but from that month a considerable decrease for two months. From June on there was a steady advance until October, but then they fell off again, losing $1,361,580 from October to December. The earnings of the latter month were, however, $3,000,345 above those for January, a gain of 60 per cent. In 1907 the monthly net earnings reached a maximum of $17,052,211 in October, the largest ever earned by the company. From that point there was a sharp fall, November recording only $10,467,253—a loss of 38.6 per cent. from October; and December $5,014,728, a loss of 70.6 per cent.

The report includes a statement of the total tonnage of unfilled orders at the close of each quarter for a series of years. These orders reached their highest point at 8,489,718 tons on Dec. 31, 1906. There was a decrease in 1907 to 8,043,858 tons on March 31; 7,603,878 on June 30; 6,425,008 on Sept. 30; and 4,624,553 on Dec. 31. In 1908 the figures were 3,765,343 tons on March 31; 3,313,876 on June 30, this being the lowest point reached since Sept. 30, 1904; 3,421,877 tons on Sept. 30; and 3,603,527 tons on June 30, a slight recovery from the low point of the June quarter.

Mineral Concessions in India

In practically all of the native states of India mineral rights belong to the respective rulers, and concessions for mining and prospecting are granted under rules involving some supervision by the government ("Sketch of Mineral Resources of India," by T. H. Holland). In some parts of the country surface rights, by the terms of settlement, carry mineral rights as well; however, in the remainder of the country the government retains rights over the minerals and grants concessions for exploration in accordance with the terms set down in a set of rules.

Two sorts of concessions are granted, prospecting licenses and mining leases. The former are granted only to persons holding certificates of approval from the local governments. The application for such a license must contain certain specified particulars and the holding of it entails upon the holder the following out of a number of conditions. These are clearly set forth in the license and are in no way onerous.

The mining leases too may be granted by the local governments for periods of 30 years, but only under the condition that no one lessee, or those joint in interest with him, shall hold more than 10 square miles, the block not to exceed, without previous approval of the government of India, four times its breadth. To insert a renewal clause in a lease also requires the same approval.

As with prospecting licenses the conditions to be contained in the lease are specified besides which the local governments are allowed to add such stipulations and conditions as seems fit.

In buying an air compressor, S. K. Patteson (*Min. Sci.*, Jan. 7, 1909) recommends the purchase, other things being equal, of the compressor that gives the desired capacity at the slowest speed. This should be done even at a somewhat greater first cost so that the air capacity can be increased considerably whenever desired by simply increasing the speed at which the compressor is run. This is an extension of a principle used in Cornish pump design.

January Dividends

The accompanying table shows the dividends paid in January, 1909, by mining and industrial companies in the United States and by some foreign mining companies:

U. S. Mining Companies.	Location.	Amt. per Share.	Amt. Paid.
Alaska Mexican	Alaska	$0.40	$72,000
Alaska Treadwell	Alaska	0.75	150,000
Alaska United	Alaska	0.25	45,000
Am. Smg. & Ref., com.	U. S.	1.00	500,000
Am. Smg. & Ref., pfd	U. S.	1.75	875,000
Anaconda	Mont.	0.50	600,000
Boston & Mont	Mont.	3.00	450,000
Bunker Hill & Sullivan	Idaho	0.25	75,000
Colorado	Colo.	0.08	80,000
Copper Range	Mich.	1.00	384,185
Federal, M. & S., com.	Idaho	1.50	90,000
Homestake	S. Dak.	0.50	109,200
Jamison Min. Co.	Cal.	0.02	7,800
New Idria	Cal.	0.30	30,000
Portland	Colo.	0.04	120,000
Silver King Coalition	Utah	0.30	367,328
Snowstorm	Idaho	0.03	45,000
Tonopah of Nev.	Nev.	0.25	250,000
Utah Cons	Utah	0.50	150,000
United States, com.	Utah	0.50	175,467
United States, pfd	Utah	0.87½	425,114
Vindicator, Cons.	Colo.	0.03	45,000
Total			$5,046,094

Foreign Mining Companies.	Location.	Amt. per Share.	Amt. Paid.
Buffalo Mines	Ont.	$0.06	$54,000
Crown Reserve	Ont.	0.16	280,000
Dominion Coal	N. S.	1.00	150,000
Dos Estrellas	Mex.	1.00	300,000
Guggenheim Expl	Mex.	2.50	262,500
La Rose	Ont.	0.20	228,674
Mines Co. of Am.	Mex.	0.02	40,000
McKinley-Donagh	Ont.	0.05	100,000
Nipissing	Ont.	0.25	300,000
N. Y. Hond. Rosario	C. A.	0.10	150,000
Temiskaming	Ont.	0.06	150,000
Tezuitlan	Mex.	1.50	15,000
Total			$2,030,174

U. S. Industrials.	Location.	Amt. per Share.	Amt. Paid.
American Cement	Pa.	$0.30	$60,000
Central C. & C., com.	Mo.	1.50	76,875
Central C. & C., pfd.	Mo.	1.25	23,438
Consolidation Coal	Md.	3.50	358,750
Empire Steel & Iron, pfd.	N. J.	1.50	37,500
Fairmount Coal Co	W. Va.	2.00	240,000
General Chemical, pfd	U. S.	1.50	150,000
National Lead, com.	U. S.	1.25	186,318
Sloss-Sheffield, pfd.	Ala.	1.75	117,250
United Metals Selling	U. S.	5.00	250,000
Va.-Car. Chem., pfd.	U. S.	2.00	360,000
Total			$1,860,131

At Broken Hill Proprietary mine, Australia, 10x10-in. sills are used for the drift sets in soft ground and 4x10-in. sills in hard ground.

Australasian Gold Production

Advance statements cabled from Australia give the gold production of the several States for the year; the figures varying but slightly from the estimates made by our correspondent, and published in the JOURNAL of Jan. 9. Any further changes made by the final returns will be slight. In the following table the figures are given in fine ounces, the comparison being with the corrected returns for the previous year:

	1907.	1908.	Changes.
W. Australia...	1,697,554	1,648,505 D.	49,049
Victoria..	695,576	676,001 D.	19,575
Queensland...	465,882	461,359 D.	4,523
New S. Wales..	247,363	224,792 D.	22,571
Tasmania.	65,355	60,453 D.	4,902
S. Australia...	10,651	14,500 I.	3,489
Commonwealth..	3,182,381	3,085,610 D.	96,771
N. Zealand...	477,312	472,095 D.	5,217
Total...	3,659,693	3,557,705 D.	101,988
Value..	$75,645,854	$73,537,762 D.	$2,108,092

The returns for South Australia include the gold from the Northern Territory, which is attached to that State for administration purposes.

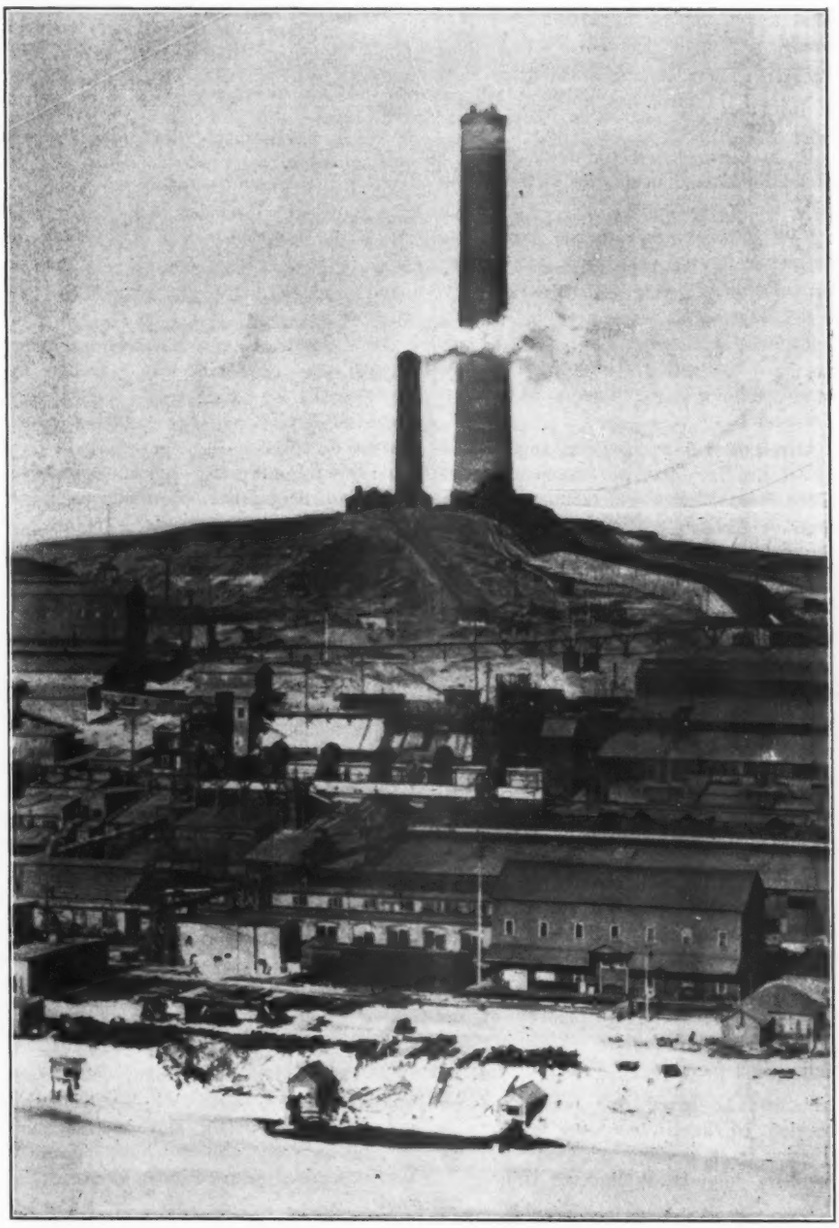
The total gold production of Australasia was, therefore, less in 1908 than in 1907 by $2,108,092, or 2.8 per cent. The causes for the changes have been recently explained. The figures show that gold mining in Australia last year very nearly held its own, and is apparently recovering from the depression of the previous year.

Saddle Reefs of Bendigo, Australia

The ore at Bendigo, Victoria, Australia, occurs in saddle reefs which are simply bedded veins that occur along anticlinal folds and which "peter out" on the legs of the anticlines. These saddle reefs extend longitudinally for a great distance, being traced by the headframes along them for miles. There are three main lines of saddle reefs, according to Donald Clark (*Aust. Min. Stand.*, Nov. 18, 1908). The New Chum line is five miles long. Sometimes several reefs occur one above the other separated by varying distances of barren rock. The centers of each of these saddles is farther east than that of the one above. The deepest one of these reefs that contains pay ore is the one found at a depth of 4124 ft. in the Victoria Quartz mine. Vein material containing gold, but not in paying quantity, has been struck in this mine at a depth of 4525 ft. in a crosscut from the bottom of a winze from the 4254-ft. level. This is the deepest known occurrence of gold in the world.

New Stack of the Boston & Montana Company

The program of the 22d annual meeting of the Montana Society of Engineers, held at Great Falls, Mont., contains a new photograph of the great Custodis stack of the Boston & Montana company, recently described in the JOURNAL. The accompanying reproduction shows a comparison in size with the old chimney even more striking than that which appeared in earlier photographs.



NEW AND OLD STACKS, GREAT FALLS SMELTER, MONTANA

The amount of ore mixture that can be run over a water-jacketed steel connection-spout on a copper blast furnace is approximately 25,000 tons.

Rhodesian Mines

The gold production of Rhodesia in December is reported at 51,637 oz., making the total for the year 607,015 oz. Comparisons by quantities cannot be made with the previous year, since the reports in 1908 were made chiefly in fine gold, while in 1907 they were in bullion. By values the total for the year was $10,603,907 in 1907, and $12,293,234 in 1908; an increase of $1,689,327 last year.

Other metal production reported in the month of December included 22,349 oz. silver, 69 tons lead and 10 tons copper. Ores reported were 4081 tons chrome ore, 6 tons wolframite and 3 tons scheelite. The asbestos mined was 18 tons. The coal production from the Wankie mines was 18,094 tons.

Personals

Herbert C. Hoover will be in New York about the middle of February.

G. W. Maynard, of New York, is recovering from a serious illness.

H. B. Pulsifer is at his permanent address, 817 Oak street, Kansas City, Missouri.

Mark R. Lamb is now with the Allis-Chalmers Company at Milwaukee, Wisconsin.

Carl F. Dietz, having finished his work at Parral, Mexico, has gone to Magdalena, New Mexico.

E. McCormick, of Calumet, Mich., is examining copper properties in the Northwest for local clients.

J. W. Mercer has returned from Ecuador, where he has been since last October. He will in a few days start on a trip to the West.

R. V. Norris, of Wilkes-Barre, Penn., has been delivering a course of lectures on coal-mining to the students of Harvard University.

Alfred R. Glancy, general superintendent of the Juragua Iron Company, Cuba, sailed from New York Jan. 29, for Santiago de Cuba.

Willard S. Morse has not resigned from the American Smelting and Refining Company, the previous report to that effect being incorrect.

E. G. Smith has been appointed superintendent of the Westmoreland Coal Company in Pennsylvania, succeeding B. F. Jones, deceased.

T. Lane Carter, of Johannesburg, Transvaal, is examining mines in Nicaragua. His address is care American Consul, Bluefields, Nicaragua.

J. H. Susmann has resigned his position as treasurer of the Tennessee Copper Company, and Walter Lewisohn has been elected in his place.

J. B. Tyrrell, Toronto, Ont., has been chosen a corresponding member of the council of the Institution of Mining and Metallurgy, London.

Thomas L. Lewis has been reëlected president of the United Mine Workers of America by a decided majority over his opponent, John H. Walker, of Illinois.

Henry M. Adkinson, manager for the Gold Pioneer Company at Telluride, Colo., has returned to Denver from a business trip to the East of six weeks' duration.

Herbert Haas has resigned his position as manager of the mining department of the Union Iron Works Company, San Francisco, and will resume practice as a consulting engineer.

Frank Dunbar, recently superintendent of the Gallatin mine of the Monongahela River Consolidated Company, has been appointed general manager of the Sesser Coal Company's mines at Sesser, Illinois.

Frank A. Keith has resigned his position as general manager of the Tonopah Mining Company, of Nevada, and has opened an office as mining engineer in the First National Bank building, San Francisco.

Percy E. Barbour is at Minas Nuevas, Sonora, Mexico, where he is engaged with A. J. Yeager, the general manager, and W. M. Clark, the consulting engineer, upon the design of a 200-mill and cyanide plant for the Zambona Development Company.

H. F. de Bardeleben, Jr., has resigned his position as superintendent of the Woodstock Iron Company, at Anniston, Ala., to enter business with his father, H. F. de Bardeleben, Sr., of Birmingham, Ala., who has large holdings of mineral lands and is one of the pioneers of the district.

R. Y. Williams, who has been a member of the staff of engineers conducting the work at the United States Geological Survey station at Pittsburg, has been transferred to Urbana, Ill., where he will have charge of the Survey's substation, established to disseminate knowledge of mine-rescue work.

H. Hunter, of London, who have been engaged in examining mines in Japan for seven months past, sailed from Kobe Dec. 31. He will spend some time examining tin mines in the Straits Settlements, and also the new tinfields in Siamese Malay and Burma, and expects to reach London about the end of May.

Ladd & Baker, Incorporated, is the name of a corporation formed to conduct a practice as consulting, metallurgical and contracting engineers, with offices in the Real Estate Trust building, Philadelphia. The officers are James B. Ladd, president; David Baker, vice-president; Francis H. Easby, treasurer.

F. R. Wadleigh, for 12 years chief inspector and fuel engineer for Castner, Curran & Bullitt, has been appointed assistant general manager of the Chesapeake & Ohio Coal and Coke Company, with headquarters in New York. Mr. Wadleigh will act as chief inspector and fuel engineer for the company, and will have charge of the inspection, preparation and use of its coal.

Obituary

John Cadegan died in Bridgeport, N. S., Jan. 20, aged 51 years. He was born in Nova Scotia and worked for a number of years as a coal miner and foreman. For eight years past he had been mine inspector for the Cape Breton district.

Edward L. Fuller, known as a large operator of salt mines and works, and also through his successful formation of the International Salt Company, died of apoplexy Jan. 29, at Augusta, Ga., where he went for his health. He was 57 years old. He was president of the Retsof Mining Company, Empire Limestone Company, and a director of the Western Railroad Mining Company. He was a member of several New York Clubs.

Thomas Jones died of apoplexy at his home in Neodesha, Kan., Jan. 11, aged 68 years. Mr. Jones worked in the zinc smelters at Swansea, Wales, from his boyhood until 1867, when he engaged with Mr. Siemens in the steel business and in 1869 was employed by the German government to operate Siemens furnaces in connection with some steel works in Germany. In 1872 he came to the United States and superintended the construction of steel works near Providence, R. I. Following this he engaged in the manufacture of spelter near Providence, from dross and other waste from works in Massachusetts and the Connecticut valley. About 1879 he bought, through a broker, some ore from Virginia and, recognizing its excellent quality, located the mine in Wythe county, Va. In 1880 he, with others whom he had interested in the project, went to Virginia, bought the mine and built a smelting plant at Martin's Station (now Pulaski City, Va.) organizing the Bertha Zinc Company. This plant is still running, and is known as the Bertha Mineral Company. Mr. Jones operated these works until 1893, when he built another zinc-smelting plant at Pulaski, Va. This venture was short-lived. In 1896 he went to Sandoval, Ill., and built a small zinc plant which is still running as the Sandoval Zinc Company. In 1902 he went to Canada and succeeded in interesting the miners of that country in saving their zinc products, and in 1904 was engaged as works manager to build a zinc plant at Frank, Alberta. This plant was never completed. He was also connected with mine development work in Arkansas and Colorado at various times. Mr. Jones leaves a wife and six children. Three of his four sons are engaged in metallurgical work: T. J. Jones, superintendent of the Mountain Copper Company at Keswick and Iron Mountain, in Shasta county, Cal.; D. A. Jones, accountant for the Granby Mining and Smelting Company at Neodesha, Kan. and Archibald Jones, superintendent of the Prime Western Spelter Company's plants at Iola and Gas, Kansas.

Societies and Technical Schools

Rocky Mountain Club—At the annual meeting, Jan. 12, John Hays Hammond was elected president. The club is now planning to build a house of its own. Editors of all Western papers are invited to become guests of the club at any time while visiting New York.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Butte, Salt Lake City, Denver and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Jan. 27—Weather conditions have not improved; the heavy rains continue and all the streams are overflowing their banks, causing floods in the valley sections and doing more or less damage in the mountain and foothill regions. A number of mines have had to cease all work except pumping. In all the mining sections of the State more or less damage is being done by the high waters and many power plants have been put out of business. Reservoirs have been carried away and ditches broken in all directions.

The legislative bill which appropriates $400,000 for the improvement of the Sacramento, San Joaquin and Feather rivers to be spent in conjunction with a similar amount from the U. S. Government will probably pass without opposition. Considerable dredging will have to be done to improve those streams.

Joseph Weissbein and associates of San Francisco have obtained control of the Pittsburg, Gold Flat and Potosi Consolidated mines at Gold Flat, Nevada City district, and these mines will now be worked under consolidation through one large central shaft. A large plant will be installed.

Six miners were killed and several others injured in an explosion at the Stone Cañon Coal mines in Monterey county last week. This explosion comes just in time to aid the passage of the Rutherford bill pending in the legislature which provides for a State Inspector of Mines. When an affidavit is made by any three persons making complaint of the condition or management of any mine, then this inspector is to visit the property and make an examination and advocate such changes as he considers necessary and bring them to the attention of the management. Assemblyman Rutherford has also introduced a bill providing for the regulation of hours of labor for men who work underground and establishing an eight-hour day for miners. Senator Riley has also a measure, which is classed among the employers' liability measures.

The Forest Service will not include certain lands in the Tahoe and Plumas national forests until after further examination. This land embraces a strip from 10 to 30 miles wide from Forbestown, Butte county, to Placerville, El Dorado county, and is foothill land fit for agriculture and for mining purposes.

The California Liquid Asphalt Company is moving its plant from Summerland to Edna, San Luis Obispo county. The new refinery will have a capacity of 2500 tons per month. There is an abundance of heavy oil available at the new place. It is cheaper now to produce asphalt from the base of the heavy California oils than to mine the clear asphalt itself. As a result, most of the asphalt miners of the State have quit working. California asphaltum has to be shipped East on sailing vessels, as it will hardly bear railroad or steamship rates. There are very few vessels, however, sailing to New York from the California ports. The first one in a year was lately loaded at San Francisco. Large quantities of asphalt are being made into coke at the greater refineries at Point Richmond, on San Francisco bay.

A new corporation of local men has arranged to deliver water at any one of the four sidings of the Midway oilfield in Kern county at the rate of 5c. per barrel. The fact of the shipments being regular will be of great benefit to the oilmen of the district. Two 13-in. wells 680 ft. from the starting point of the Sunset line are the source of supply. The plant is equipped with both electric and steam power. The Midway oilfield has been held back by lack of water heretofore, and this new steady supply is of great benefit.

Salt Lake City

Jan. 29—The Yampa smelter is treating more than 800 tons of Yampa ore per day; everything is working smoothly. The plant comprises nine McDougal furnaces, three reverberatories, three blast furnaces and a converter.

The Phœnix mill is treating 50 tons of Utah-Apex ore per day, and the Wall mill 50 tons per day. The Utah-Apex company is shipping from 50 to 60 tons of smelting ore per day. Connections with the Boston Consolidated railroad have been made, and ore can now be loaded directly into railroad cars.

Before Feb. 15 the United States company will add 1280 sacks to its bag house, making a total of 3380. The company's concentrating plant at Bingham Junction will probably be enlarged in the near future.

D. C. Jackling returned on Jan. 28 from a meeting of the Ray Consolidated Copper Company at Colorado Springs. At this meeting he was made general manager of the company; he will design a large concentrating plant and smelter to be erected at Kelvin, Ariz. Mr. Jackling states that the new position will not interfere in any way with his management of the Utah Copper Company's properties.

On Jan. 27 the case of the Mammoth Mining Company *vs.* The Grand Central Mining Company came before the Supreme Court at Washington on a writ of error from the Supreme Court of Utah. The Grand Central brought action to recover $300,000, the value of ore alleged to have been taken by the Mammoth company. The Grand Central won in the Utah court. The question involved is the right of the Mammoth company to follow a vein, the apex of which it is claimed was in Mammoth ground, to a point where it underlies the Silveropolis claim, the surface of which is owned by the Grand Central.

At Park City last week was the liveliest one in many months. At the Daly-West all energies are directed toward completing the drain tunnel, and making connections with the upper workings. The mine will soon be drained to a depth exceeding 2000 ft. At the Daly-Judge considerable work is being done, and connection between the McSorley and Daly drifts will shortly be effected. This will give the Bonanza Flat region a shorter outlet.

A drift on the 300-ft. level of the Little Bell at Park City has cut a body of rich carbonate and chloride ore. The orebodies of the Little Bell have been developed from the 400-ft. to the 700-ft. level.

The Uintah Treasure Hill Company has levied an assessment of 1c. per share. This will put $10,000 in the treasury.

In reply to the opposition of the present management of the Daly-West Company, J. E. Bamberger, president of the company, states that no consolidation of the Daly-West with the Ontario company has been or is under consideration. The reason for suspension of dividends last year was on account of labor difficulties and low metal prices, but during the year extensive development was done in opening the mine at greater depth. This development is expected to show up large quantities of milling ore, and extensive additions to the mill are planned. He announced that the Daly-West company is now in first-class physical condition, well equipped, has no debt, has about $300,000 in the treasury, and can resume dividends at an early date.

Grading work has commenced on the Tooele Valley railroad, which will connect the International Smelting and Refining Company's projected smelter with the Salt Lake route at Garfield and Tooele

city. Upon the completion of the line from Tooele, which will require about two months to build, building material will be shipped to the smelter site. Preliminary smelter plans are expected some time during February. The plant will have a capacity of 2000 tons a day and will cost from two to three million dollars.

The Conkling Mining Company has filed in the Federal court a suit of ejection against the Silver King Coalition Company; the plaintiff seeks an accounting for 20,000 to 25,000 tons of ore, valued at between $800,000 and $1,000,000 which the King company is alleged to have extracted from Conkling ground. The Silver King Coalition Company is again loading ore, and shipments will be resumed at once. The Miners Smelting Company, a Heinze concern, had a contract with the Silver King company which went into effect Jan. 1. Under this the King ore was to be treated at the Milford plant of Heinze's company, but it is said that an agreement has been reached under which the ore will be shipped to the Murray smelter.

For the week ending Jan. 14, the mines of Tintic shipped 76 thirty-ton cars of ore and 89 twenty-ton cars. The Tintic Smelting Company shipped 5600 bars of bullion.

The Colorado mine shipped 51 twenty-ton cars; Black Jack, 5; Brooklyn, 5; Beck Tunnel, 8; Dragon Iron, 22; Mammoth, 1 car. The Bullion Beck mine shipped 2 thirty-ton cars; Centennial Eureka, 42; Eureka Hill, 1; Iron Blossom, 2; May Day, 4; Ridge & Valley, 2; Sioux Consolidated, 14; Uncle Sam Consolidated, 4; Yankee Consolidated, 2 cars.

Butte

Jan. 28—The recent visit of H. G. Elliott, expert for the Pittsburg Coal Company, to the coalfields near Great Falls, Cascade county, is thought to be the forerunner of active participation by the company in operations in that part of the State.

In the contest of the Government against the British-Butte company, preventing the issuance of the patent to the company for its placer claims at Rocker, five miles west of Butte, the acting receiver and register have rendered their opinion in favor of the company, and recommend that the patents be issued. The contention of the Government was that the company had fraudulently applied for patent of the ground as placer when in fact the land was valuable only for its lode deposits, and also that the company failed to do the required $500 worth of work on its claims.

Denver

Jan. 30—The great activity in the Boulder oilfield, which has been caused by the opening of the 300-bbl. well of the Inland company, continues, and numbers of new wells for oil and gas will be put down at once.

Mining operations in the Silverton, Telluride, Ouray and other districts of the San Juan region have been greatly hampered by snow slides during the recent storms. Railways are blocked in places, and may remain so for weeks, as the avalanches have packed the snow so tightly that the rotary plows are powerless to cut through it. Telegraph, telephone and power lines are down, the coal supply is cut off from many towns, and general discomfort prevails. At Telluride the Liberty Bell mine is said to be producing 10,000 tons per month of $8 and $10 ore, with reserves sufficient to keep the mill running for 15 years.

In the Cripple Creek district, the Vindicator Consolidated Gold Mining Company has issued its report for 1908, showing proceeds, after deducting freight and treatment, of about $712,000, of which lessees received $161,567; total cash balance after paying $225,000 dividends in 1908, $78,814. This company has paid dividends of nearly $2,000,000.

Indianapolis

Feb. 1—The irregular condition of the Indiana coalfield was suddenly interrupted by an increased number of orders for coal due to a spell of genuine zero weather which broke over the central States the latter part of the week. The local dealers had permitted stock to run low.

The action brought by the Vandalia Coal Company against 18 coal miners who received injuries by an explosion in the Rosebud mine in Vigo county, to prevent them from maintaining separate suits at law to recover damages and to compel all of them to prosecute their claims in one proceeding in equity, has been decided adversely to the company by the Appellate Court, which held that a bill of peace cannot be maintained to prevent a multiplicity of suits in such a case.

A bill has been introduced in the Indiana legislature to prohibit employers of miners and other labor from taking out indemnity insurance against judgments in case of injury or death of an employee. It is claimed that such security makes employers careless regarding the safety and welfare of employees.

London

Jan. 20—The gold output of the mines of the Witwatersrand district, Transvaal, during the month of December was announced as 637,853 fine oz. of gold. These figures, however, include about 36,000 oz. of reserve gold accumulated from previous months. The custom of holding gold reserves, still maintained by several companies detracts from the value of the monthly statistics. The professed aim of the directors of the companies in keeping a gold reserve is to equalize the monthly outputs and to prevent the shareholders from being unduly elated or depressed with the fluctuating returns that might otherwise take place. The absurdity of the system is revealed at the end of the year when the average yield has been incorrectly estimated and a large balance of undeclared reserve gold remains. In the December return several of the mines have declared a surplus of from 2000 to 3000 oz. equivalent to 2 to 7 per cent. increase in the profits for the year. The profits earned during the 11 months January to November have been to this extent inaccurately reported. An extreme case is that of the Ferreira gold mine, which at the close of the year let loose as much as 12,330 oz. from the accumulated gold reserves, equal to £51,786. The average monthly profit reported for 11 months was £33,333, whereas in reality it was about £4310 more per month. Consequently the published monthly returns were about 8 per cent. below their actual value, and the shareholders, whose nerves the Rand directors take so much trouble to protect by their gold-reserve system, have to suffer a severe, though not unpleasant, shock in December.

It is well known that the profits shown on working account differ considerably from the profits distributed in dividends and the nearer such profits can be brought to the dividend the better pleased will the stockholder be. As an example of the discrepancy between the published profits and dividends the case of the Ferreira may again be noticed. This mine published profits for the year 1908 amounting to, in round figures, £400,000. A further profit, as mentioned above, in the shape of gold reserve, amounting to £51,786, was declared in December, making altogether a working profit of £451,786. The dividend declared was, however, only £285,000, namely, 300 per cent., on a capital of £95,000. Shareholders may well ask why so large a margin is being accumulated.

While on the subject of returns, it may be questioned whether the elaborate statistics, some of which as explained above, are inaccurate, are necessary. Every month each mine cables home the number of stamps, tube mills, tons, ounces won from the different processes; indeed, so many figures that it takes some time for a shareholder, interested in any mine, to pick out the figures he really wants, namely, the tons treated and the profit earned. The expense of all this cabling must be heavy as well as the preparation of the statistics. It is doubtful whether all this technical data is wanted monthly. At all events this much is certain: that if monthly reports were dropped and quarterly reports substituted, a considerable saving for the shareholders could be made.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

For a number of years the Tennessee Coal, Iron and Railroad Company and the Sloss-Sheffield Steel and Iron Company have been working convicts in some of their coal mines. This year three other companies have begun to operate with convict labor. The Red Feather Coal Company contracts with the State of Alabama for the hire of a number of convicts, who will be employed in getting out coal at the company's mine at Lucile, in Bibb county. The Bessemer Coal, Iron and Land Company has contracted for State convicts, who will be employed at one of the mines at Belle Ellen, in Bibb county. The Pratt Consolidated Coal Company has agreed to hire the county convicts from Jefferson, Tuscaloosa, Walker, Blount and Morgan counties. These men will be used at the company's coal mine at Banner, in Jefferson county.

A syndicate represented by Dr. G. B. Crowe has purchased a large tract of land at Bessemer from the Bessemer Coal, Iron and Land Company. It is announced that the improvements to be made will include 250 coke ovens, the coal for which will come from the Yolande and other mines now operated by Doctor Crowe; also two blast furnaces with a capacity of 250 tons each daily. An electric plant will be operated by the waste gases from the coke ovens. A brick plant will also be erected.

JEFFERSON COUNTY

Johns Coal Mine—At this mine, owned by the Tennessee Coal, Iron and Railroad Company, a coal washer of the bumping-table type is being put in by Heyl & Patterson, of Pittsburg, Penn. A thorough test of the washing system will be made.

Birmingham Coal and Iron Company—An explosion on Feb. 2 in slope No. 2 of the company's coal mine at Short Creek killed 17 men.

Arizona

GILA COUNTY

Arizona Commercial — Development work continues to open good orebodies. A 350-ton smelter will be erected next summer.

Superior & Globe—It is reported that this company plans to develop vigorously during the next few months.

PINAL COUNTY

Ray Consolidated—This company is to build a mill and smeltery at Kelvin. The first unit of the mill will be of 3000 tons daily capacity. Upward of 7,000,000 tons of 2 to 2½-per cent. ore is now said to be developed, which has been done chiefly by churn drilling.

California

AMADOR COUNTY

South Eureka—The North drift 500 ft. long on the 2700-ft. level has struck the same footwall and payshoot found on the 2500-ft. level. It forms a 20-ft. vein of milling ore.

BUTTE COUNTY

Big Blue Lead—Power lines have been installed and the arastre will be operated by electric power.

Mesilla Valley—This company, E. C. Wilson, superintendent, has acquired the old Flea Valley ditch so as to have its own water power. A bedrock tunnel is being run to intersect the old channel.

Cape Horn—This company is shipping gold bars.

CALAVERAS COUNTY

Angels—At this camp a shortage of water closed down most of the mines for some weeks. Now the rainfall has been so heavy that the mines are having more water than they want.

EL DORADO COUNTY

Gravel—Under management of T. G. Patton men are at work opening a large gravel property near Pacific, about three miles from the Prevolcanic property.

Greenwood Creek—At this place the company which is opening several quartz claims has struck good paying lodes on the Lipton No. 1, and also on the Dundee No. 1. The ore carries gold, silver and copper.

INYO COUNTY

Loretta—This mine, formerly the McAffee, at Eureka valley, 30 miles east of Big Pine, is being developed.

NEVADA COUNTY

Omega Placer—Work is about to be resumed on this mine at Omega.

Murchie—This company has shipped 60 tons of sulphides to the Selby smelter.

PLUMAS COUNTY

Greenville-Pacific—This company, W. S. Haskins, manager, has bonded the New York mine at Greenville from J. D. Whitney. A 400-ft. tunnel is expected to open up valuable oreshoots.

SAN LUIS OBISPO COUNTY

Hamilton Quicksilver Mine—A large deposit of cinnabar ore has been struck in this mine on San Simeon creek, near Cambria. Work has been prosecuted on the property for two years, hitherto without much success.

SHASTA COUNTY

Minnie Shasta—This company has made its last payment of the purchase price of $20,000 for the Bracket quartz mine, four miles west of Redding.

Hazel—In the Gladstone mine of this company, at French Gulch the vein found on the 600 level is wide and rich.

SIERRA COUNTY

Bonanza King—From this mine at Alleghany, E. H. Wilson manager, very rich quartz is now being taken. The vein is about two feet wide. Another tunnel will shortly be run.

Twenty-One—This mine, a continuation of the Rainbow at Alleghany, has been placed under bond to C. C. Crary representing eastern men. Development work has commenced.

SISKIYOU COUNTY

A new company has taken hold of the Foster & McIntosh quartz mines near Callahan, and men have been set at work.

SONORA COUNTY

Culver-Baer Quicksilver Mining Company—This company, of Cloverdale, intends to erect a 40-ton Scott furnace.

TRINITY COUNTY

Trinity Gold and Milling Company—For loosening up ground at this hydraulic mine at Minersville, 15 tons of powder were exploded simultaneously in four blasts. A 300-ft. tunnel was run into the gravel and from this were run drifts to contain powder.

TUOLUMNE COUNTY

C. W. Wagner and W. C. Bowman are opening a copper mine at Chinese. Some gold is found in the ore.

Imperial—This group near Jacksonville has been bonded to San Luis Obispo county men and the mines are to be worked on a large scale.

Central Mother Lode—At this property, J. P. Mangante, superintendent, a two-

compartment shaft has been started to be sunk 200 ft. before drifting is commenced. An engine and hoist are shortly to be installed and later a ten-stamp mill will be put up.

Nervi Gold Mining Company—This company has secured options on the purchase of the Galena and Buckeye mines near Italian Bar for $30,000. Miss F. M. Colby is president and general manager of the company.

Option—Plemon, Vierira & Lind have taken an option on 400 acres of patented land owned by A. Bonavio on which mining will commence at once; 25 per cent. of the net proceeds of the returns are to be paid to the owner of the ranch.

Colorado

Lake County—Leadville

Dinero Tunnel—Work has been resumed on this property, Sugar Loaf, and the upraise, to connect with the old shaft, is being pushed. When this connection is made attention will be turned to developing the large body of ore at the breast of the tunnel.

Yak Tunnel—Four drill holes have penetrated the water in Resurrection No. 1 shaft, and the water in that property is being lowered at the rate of 5 ft. per day. Four more drill holes will be drilled and it is expected that the bottom of the shaft will be seen within 30 days. In the meantime the water pouring into the tunnel will be piped, and when this is completed the work of driving ahead will be resumed.

Alps Group—This property, head of South Evans gulch, is under lease to James Kavanaugh and associates. A shaft is being sunk.

Cleveland Shaft—The management of this property, South Evans, has decided to sink this shaft 200 ft. instead of 100 ft. as first intended. When the work is completed the shaft will be 825 ft. deep.

Tribune—This property, Breece hill, is worked from the Yak tunnel by a drift following a small streak of ore high in gold; it is expected that in another 30 ft. an ore shoot from the Ibex will be caught.

Belvidere Tunnel—This bore, Horseshoe district, is in 400 ft. and the orebody shows up well. On account of the heavy snows the ore is piled on the dump. With the disappearance of the snow connections will be made with the Chance-Hilltop tramway, which will facilitate the handling of the ore.

Little Bertha—This property, Breece hill, is under lease to J. B. McDonald, who has sunk the shaft to 225 ft. and from this point with drifts north and south opened a body of gold ore. The property adjoins the President.

Chrysolite—In this mine, Fryer hill, a fair body of lead ore has been opened at the lower level and shipments are being sent. The mine is also producing some excellent iron.

Great West—A tunnel has been driven on this mine, Buckskin gulch, for 200 ft. on a fissure vein that averages in width 4 ft., carrying gold, silver, lead and zinc; several shipments have been made from the vein giving returns of $600 per ton. The tunnel will be driven 300 ft. farther into the hill, so as to drain the ground; then stoping will be started. The property is being worked by Leadville men.

Result—This mine, Carbonate hill, is owned by the Small Hopes Company, and recently a promising body of oxidized iron carrying 18 oz. silver to the ton was opened in the lower workings; the body has been developed for 20 ft., and at the breast is 12 ft. long and 6 ft. thick. Shipments have been started.

Shamus O'Brien—This mine, Yankee hill, is being worked at the lower levels by lessees, and recently they opened a 4-ft. body of ore that runs well in silver and lead; in addition to this there is some low-grade ore; shipments are going out weekly.

Vinnie—Some rich gold ore is being taken from this mine, Breece hill, while from the main orebody regular shipments are going to the smelter.

Teller County—Cripple Creek

Drainage Tunnel—At the annual meeting of the stockholders of the tunnel company the following directors were elected: F. G. Peck, Sherwood Aldrich, A. E. Carleton, F. F. Castello, F. J. Campbell, C. C. Hamlin, J. T. Milliken, William Lenox and A. L. Burris. The old board was re-elected with the exception of S. S. Bernard who was succeeded by A. L. Burris. The annual report of the treasurer shows that of the $388,500 subscribed for driving the tunnel $175,000 is still due. Cash on hand $23,820 with all the work paid for up to Jan. 1, 1909. This gives about $200,000 for the work and it is estimated that it will take about $120,000 more to complete the work. At present work is pushed at both the portal entrance and the intermediate shaft. The work is done under contract by A. E. Carleton, of Cripple Creek.

Wish Bone Mill—Additional machinery is being put in place at this mill which is situated on the north side of Mineral hill. Surveys are also being made for a railroad from the main part of the district to this mill. The road will be run from Hoosier Pass and will be of standard gage. The mill was originally built to treat ore on the ground but for some reason no ore was ever put through and the management has decided to handle custom ore, for which purpose the railroad is being constructed.

Cripple Creek & Colorado—The shaft house on the property, usually known as the Rittenhouse property, was burned this week and was almost a total loss. The shaft house was equipped with a fine plant of machinery and, it is understood will be rebuilt at once. The property is worked under lease by W. A. Birdsall, of Cripple Creek.

Gold Coin—This company has declared a dividend of 2c. per share amounting to $20,000.

Idaho

Shoshone County

Alice—About $1,000,000 worth of ore has been blocked out and an official states that work will commence within the next 60 days on a new concentrator.

Success—Work will be resumed on this zinc property about the beginning of April. A force of about 100 men will be employed in both the mine and mill.

Copper Plate—A report issued to the stockholders states that about $7000 worth of work was done last year, bringing the total development to about 2200 feet.

Oreano—A financial statement by the secretary shows that, in 1908, $3000 was spent on the property, mainly from assessments on capital stock. Another assessment has been levied for continuing development work.

Ajax—The force of workmen has been doubled and the long drift tunnel has been driven about 1600 feet.

H. E. M.—A contract for 400 ft. of work has been let.

Tiger—A large area of the upper workings caved in, but no damage was done. The property was recently abandoned by the Federal Mining and Smelting Company and had just been dismantled of machinery. Some ore is still shipped under lease.

Black Horse—The ore recently encountered has widened to about 7 ft., practically all of shipping grade.

Boise County

Columbia Mining Company—A concentrator has been added to the Last Chance mill. Work will be started on material from the new orebodies recently uncovered.

Gold Hill & Iowa Mines Company—The upper levels are worked by lease. Plans are being made to drive all machinery electrically. For this purpose the new power line will be extended from Centerville, where it will tap the main line from the Payette dam.

Indiana

Daviess County

The Indiana-Kelly Coal Company has leased 740 acres of coal land a few miles south of Washington, and will develop the territory. A few Washington capitalists

are interested. The company is also making an investigation of a newly discovered block coalfield in Fountain county.

VERMILION COUNTY

The Clinton Coal Company has purchased for $29,000 a tract of 574 acres of coal land west of Clinton. The company is one of three operating in the Clinton field. It now has the Crown Hill mines 1, 2 and 3, and proposes to open mines on the newly acquired land. The Deering Coal Company, which has eight mines in this field, is preparing to sink additional shafts west of Clinton.

Michigan

COPPER

Calumet & Hecla—In the Federal Court at Cincinnati on Feb. 2 the appeal of Charles Bigelow, president of the Osceola Consolidated Mining Company, from the decision of the Circuit Court of Western Michigan in Bigelow's case against the Calumet & Hecla company was refused. The Calumet & Hecla company is in control of the voting power of the majority of the Osceola company's stock, and at the last annual meeting placed directors in office who were opposed by Bigelow and the stockholders represented by him. In his suit brought in Michigan Bigelow alleged that the control of the Osceola company's votes by the Calumet & Hecla company was a violation of the interstate commerce act. The Court of Appeals holds that there is no violation. Bigelow will carry the case to the Supreme Court.

Obijway—No. 2 shaft has reached the 3d or 650-ft. level, and a crosscut has been started to cut the lode, which in all probability will be reached within a week. The lode when opened in the level above was about 14 ft. wide and well charged with copper, being a decided improvement over the showing on the 1st level. No. 1 shaft is approaching this same depth. The shaft has not cut the footwall below the 500-ft. level, but it will not be necessary to crosscut very far to reach it. The lode opened at the 1st or 500-ft. level of this shaft was in two beds, about 20 ft. and 13 ft. wide, respectively, and separated by about 15 ft. of trap rock.

Atlantic—Section 16 shaft is being sunk below the 2000-ft. mark. The rock passed through is much shattered. The lode, intersected by the crosscut from the 15th level about 400 ft. west of the shaft, is strong and may be the much sought Baltic lode.

Wyandot—Another copper-bearing lode has been found in the crosscut driven from the 700-ft. level of the exploratory shaft. Driving on this find will soon begin. About 100 ft. of drifting has been done on the lode first found; the breasts of both drifts consist primarily of epidote well charged with heavy stamp and barrel copper. This has been the most important development in the history of the company and gives promise of good results.

Adventure—This company has discontinued the two vertical diamond-drill holes and with the aid of this additional data, is now drilling another on the approximate pitch of the formation.

Superior—The second mill gave even better results than did the first. After a few minor alterations have been made, regular shipments will begin.

Missouri

JOPLIN—ZINC-LEAD DISTRICT

Lizzie D—This company will erect a 200-ton mill on the Malang land at Peacock. It has a 15-acre lease with a shaft and three drill holes showing a 15-ft. face of ore at 192 feet.

Microbe—This company, of Joplin, has been incorporated with a capital stock of $50,000 to operate a mine at Spring City. Adam Scott, of Joplin and Kansas City and Abilene, Kan., men, are the stockholders.

Continental Zinc—This company is replacing the balanced skips in the double-compartment shaft at Prosperity, with balanced self-dumping cages. With the old arrangement the water has to be kept about 30 ft. below the drift. Large cars will be used in the mine and mules to haul to the shaft.

Cameron—This company at Sarcoxie will complete its 250-ton mill about Feb. 15.

Katherine D.—This company is preparing to sink a shaft on its 30-acre lease on the Gray land southwest of Joplin. Two drill holes show rich ore. George Pearson, of Joplin, is superintendent.

Montana

BUTTE DISTRICT

British-Butte—The new gold dredge will be put in operation on Jan. 30. Invitations to witness the event have been issued to prominent mining men and State officials.

Butte Hill Copper Company—At the annual meeting of stockholders held Jan. 23, the following were elected directors: Maurice Eisenberg, H. A. Frank, J. W. Murphy, Duncan MacRea, W. P. Cary, W. H. Hall, Thomas Driscoll, James Higgins and John F. Davies.

Columbia-Butte Mining Company—A petition for permission to change the company's name to Columbia-Butte Gold Mining Company has been filed in the local district court. It is stated that the word "Gold" was ommitted by mistake.

BROADWATER COUNTY

Keating Gold Mining Company—Jesse B. Root, president, is now in New York for the purpose of placing the stock on the curb. The management states that shipments are being made at the rate of about 65 tons per day and that the ore is giving a net return of $5.50 per ton after all expenses are paid.

MADISON COUNTY

Fortune Group—Richard T. Cook and Alfred T. Cook are working a force of men on the claims, located about five miles west of Virginia City. At a point about 300 ft. from the mouth of the tunnel on the Fortune claim a crosscut is being driven.

MISSOULA COUNTY

Kennedy Creek Coal and Coke Company—The company was incorporated a short time ago by John A. Scott, T. C. Marshall, W. J. Rhoades and Frank Thomas, of Missoula, and W. C. Edwards, of St. Paul. Its properties are located on Kennedy creek, near Stark, and when the transfers are completed will comprise about 700 acres of coal lands.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Portland Florence Lease—A vein of milling ore was recently opened on the 400-ft. level. Crosscuts are being driven on the 200-ft. and 300-ft. levels to intercept the Combination Fraction vein. This lease was formerly the Nevada Leasing Company's ground and adjoins the old Reilly lease.

Commonwealth Leasing and Mining Company—A shipment of 16 tons was made last week from this property. All this ore came from a shallow shaft. At a depth of 100 ft. several stringers have been found in the shaft, which although narrow, are rich.

Daisy Florence Lease—The four inches of rich ore that was found last week in the stope from the 200-ft. level has now widened to 2 ft. of shipping ore.

Matilda Lease—This company, leasing on the Atlanta property, is re-timbering its shaft between the 200-ft. and 300-ft. levels preparatory to sinking. A large vein was found in the drift on the 250-ft. level, but did not contain pay ore; exploration work will be carried on at greater depth.

February Premier Lease—This company, operating on the February claim of the Goldfield Consolidated, has its shaft down below 400 ft. and will continue sinking until a depth of 500 ft. is reached; then crosscuts will be run east and west to the limits of the ground.

Goldfield Star Mining and Leasing Company—The shaft on the Minnevade Fraction of the Lone Star company is 250 ft. deep. In a crosscut on the 150-ft. level

the footwall of the Lone Star vein has been cut. On the 250-ft. level a crosscut has been started to intercept the vein underneath the underhand stope, from which the Patrick lease was extracting ore at the time of the forfeiture of the lease for underhand stoping.

Goldfield Golden Pick—The shaft at this lease on the Pipe Dream lode has reached a depth of 350 ft., and is the deepest shaft on the Silver Pick property. A crosscut on the 250-ft. level disclosed a vein 4½ ft. wide carrying some gold. Work will be pushed in this crosscut, as well as on a new vein just found in the station cut on the 350-ft. level.

Goldfield Merger Mines Company—A crosscut is being driven on this property from the 600-ft. level to cut the St. Ives vein. Good ore has been found in several places.

Mohawk Ledge—This lease on the Jumbo Extension, which was granted an extension of 221 days on account of the litigation last summer between the Jumbo Extension and Goldfield Consolidated companies, resumed shipments last week. The lease does not expire until the middle of March.

C. O. D. Consolidated—The orebody between the Gold Bar and Victor claims continues to improve. A crosscut is being run from the 300-ft. level to intercept the shoot at that depth. In a drift from the bottom of the winze, 30 ft. below the 200-ft. level, the ore, 4 ft. wide, continues to be of good grade. For the last two years this orebody has been known to exist and shipments amounting to $30,000 were made from it, but work was not resumed until a consolidation securing the Victor claim was effected.

Little Florence—The annual meeting of this company was held in Phœnix, Ariz., Jan. 18. George Vickers, of Goldfield, was elected a director to succeed James E. Keelyn. The larger holders at the meeting assessed themselves so as to continue work in the lease on the Combination Fraction ground. The three-compartment shaft is now 500 ft. deep; the different levels will be prospected.

Esmeralda County—Rawhide

Murray Lease—On the 200-ft. level the rich high-grade ore recently struck is 2 ft. wide; through the high-grade ore small seams of native gold are seen. On this level about 75 ft. of drifting have been done. On the 100-ft. level the vein averages 7 ft. in width, and the ore is of milling grade. On the 80-ft. level the vein is also 7 ft. wide, but the ore is slightly richer.

Kerns No. 1 Lease—At this lease, owned by George F. Von Polenz and associates, on the Rawhide Queen property, some exceedingly rich ore has been developed. Last week two shifts were put on; about 15 men are working at this property.

Holland Rickard Lease—Some rich stringers of gold ore have lately been struck in this lease on the Coalition ground.

Daisy—At this property on the east side of Ballon Hill, a 4-ft. vein of good ore was recently struck.

Gregory Mining District—This is a new district opened up about 14 miles southwest of Fallon. The veins are large; the country rock appears to be an andesite, and from all appearance the district resembles Goldfield both topographically and geologically. Many claims have been located.

Esmeralda County—Bovard

Bovard Strike Mining Company—This property has been developed by a tunnel which is in fine milling ore. The Bovard district lies about 18 miles southeast of Rawhide.

Humboldt County—Seven Troughs

Harris Lease—Ore of exceptionally good grade has been found in the winze from the 200-ft. level. High-grade milling ore has also been opened up in the raise from the same level. A shipment is about to be made to the Kindergarten mill.

Reagen Lease—High-grade ore is being broken at several places in this property; in a drift from the raise on the 200-ft. level 2 ft. of shipping ore was recently opened.

English-George Lease—The ore being extracted from this property and now treated at the company's new mill is said to assay between $50 and $60 per ton.

Cleghorn-Duke Leases—The management of these leases on the property of Seven Troughs Signal Peak Mining Company and of the Seven Troughs Consolidated Mining Company, has recently purchased a 2¼-in. machine drill, air compressor, and two gasolene engines of 25- and 10-h.p. The equipment has been received at Lovelock and will be installed at once. The tunnel which is to be driven to develop these leases is already 400 ft. long, and will be rapidly pushed to a length of 1500 ft. so as to open the vein at considerable depth.

Wihuja Lease—On Jan. 14 the drift on the 340-ft. level broke into the oreshoot; 18 in. of this vein shows some of the richest specimens ever taken out of the property. The shoot is the same as that opened on the 265-ft. level; the ore will be stoped from the 340-ft. level. Preparations are being made for another mill run.

Lincoln County—Pioche

Finsen Ray-Black Wonder—A syndicate composed of Pioche and Salt Lake City mining men recently purchased the Finsen Ray mine the price is said to be $60,000. The Black Wonder, an adjacent property also changed hands. It is reported that a consolidation of these two properties will be effected. The ore carries lead and silver together with a little gold.

Prince Consolidated—A station has been cut on the 550-ft. level, and a crosscut is being driven to the vein. Driving is also in progress on the 300- and 400-ft. levels.

Pioche King Mining Company—This company was recently incorporated at Goldfield, the capitalization being 1,000,000 shares having a par value of $1. The ground that the company holds includes the Bullion-Belcher group of six claims, the Gladstone group of three claims and several other single claims. The ground surrounds the Prince Consolidated on the north, west and east. On completion of patent proceedings, now pending, a complete equipment will be installed and development work started.

Nye County—Helena

Broken Hills—The last carload shipment of ore from this property brought $122 per ton; the ore assayed $77.60 gold and $44.47 silver per ton. The ore was taken from the Ols shaft in which shows a vein carrying 3 ft. of high-grade ore. On account of the heavy expense of hauling, production is being curtailed until the completion of a mill which the company plans to build this spring.

Lease Block No. 16—A vein 3 ft. wide containing ore that equals in richness the Broken Hills ore was discovered last week in this lease.

Nye County—Bullfrog

Pioneer—Smelter returns on the last two carloads of ore shipped amounted to $15,000 for the entire lot; one car of 40 tons, taken out during the earlier period of development, averaged a little more than $100 per ton; the other car, sampling approximately $220 per ton gave $11,000. Another car was shipped Jan. 23 to Salt Lake City. Only the ore already broken is mined from the upper winze; all other work in the winze has stopped. Milling ore is showing in the breast of the drift on the 210-ft. level.

Nye County—Hannapah

Silver Glance—Shipments continue from the Conrad & Lain lease, the output being about one carload a week. The ore is being treated at the Belmont mill at Millers.

Nye County—Tonopah

Belmont—The South vein, which was faulted on the 1000-ft. level was found again last week; the orebody is now 5 ft. wide in the face of the drift. On the 1100-ft. level a crosscut is being run to a point under the old Belmont shaft with which connection will be made for ventilation. The raise from the west drift on 1100-ft. level to the 1000-ft. level is

finished and was in ore the entire distance of 127 ft. on the dip of the vein. Production for the week ending Jan. 23 was 550 tons.

Montana—Drifts are being extended east and west from the crosscut on the 515-ft. level which recently cut the Triangle vein. Both drifts are in ore averaging 5 ft. in width. Stoping is being carried on from the 390-, 465- and 565-ft. levels. A raise has been started on the vein from the 615-ft. level to connect with the 515-ft. level, the ore showing a width of 2 ft. Production for the week was 750 tons.

Tonopah Mining Company—Work was resumed on Jan. 20 in the drill hole being run from the 740-ft. level of the Silver Top claim; the bottom of this hole is 260 ft. below the level. The 200-gal. electric pump, which is to be installed on the 1200-ft. level of the Mizpah shaft has been shipped, and a station is now being cut for it. When in operation, sinking will be continued to a depth of 1500 ft. During the week the mill treated 3000 tons of ore averaging $23.60 per ton, and shipped 105 bars of bullion valued at $87,150 and 22 tons of concentrates valued at $9350.

Mogul Consolidated—This property, 10 miles north of Tonopah, recently made a shipment of 85 tons which returned $31.85 per ton. The ore is a lead carbonate carrying gold and silver in a quartz gangue. The main shaft is 575 ft. deep; 20 men are working at the mine.

South Dakota

LAWRENCE COUNTY

Branch Mint Operating Company—The first clean-up from 1300 tons of dump ore was better than expected and the New York interests have ordered work to proceed. The gold extraction is about 80 per cent. and the mill is treating about 250 tons daily.

Homestake—A new and simpler valve system to regulate the water supply to the mills, has been installed. The company has also purchased the timber, tie and lumber pickling plant at Englewood from the Government and will treat its own timber by the creosote method.

Warren Peak—The Rochford owners have decided to build a mill to treat the ore which averages $7 per ton gold.

PENNINGTON COUNTY

Standby—Supt. J. B. Baker, of Rochford, is planning to increase the stamps at the mill from 20 to 100 during the coming summer. Work on the property will resume as soon as the weather permits.

Mystic—A new hydraulic placer mining company has been organized by Thomas Ormsby to operate on Castle creek among the early-day placer diggings.

Tennessee

POLK COUNTY

Tennessee Copper Company—Of the $2,500,000 in cash that this company is to get from the Independent Fertilizer Company, $875,000 has so far been received.

Utah

JUAB COUNTY

Tintic Utah Consolidated—A drift on the 300-ft. level is being run east of the shaft in the expectation of cutting the Humbug vein. The Utah Consolidated claims are situated north of the Sioux Consolidated and the Colorado company's properties.

East Tintic Development Company—On the 200-ft. level a cave 60 ft. long and from 10 to 25 ft. wide has been cut, carrying as much as 10 ft. of lead sulphide and carbonate. The ore does not run high in silver.

Yankee Consolidated—At the recent meeting the following officers were elected: J. E. Dubois, president; J. E. Frick, vice-president; B. M. Lehman, treasurer and general manager; A. E. Canfield, secretary. Last year 4800 ft. of development work was done. There is a surplus in the treasury, and drifting will be pushed on the 300-, 400-, 500-, 600- and 900-ft. levels.

Beck Tunnel—This company is searching for ore on the 1100-ft. level where the showing is promising.

Plutus—The Plutus and Tetro holdings were consolidated a short time ago, and operations at the property will be started early in February. Jesse Knight is president and David Evans general manager. The company owns 14 claims. Development work will proceed in both Tetro and Plutus ground.

Alaska

COPPER RIVER DISTRICT

It is announced that the Copper River railroad has been completed from Cordova to a point above the Abercrombie rapids on the Copper river, a distance of 54 miles. A wharf for handling heavy material has been provided and four steamers are to be built to develop the copper districts of Copper and Chitina rivers. Contracts have been let to extend the railroad up the Copper river toward Fairbanks.

Canada

ONTARIO-COBALT DISTRICT

Ore Shipments—Shipments of ore from Cobalt for the week ending Jan. 23 were as follows: Chambers-Ferland, 62,000 lb.; Kerr Lake 62,460; King Edward, 53,920; La Rose, 393,650; Nova Scotia, 410,390; Nipissing, 186,033; Peterson Lake, 81,560; Right of Way, 244,715; Temiskaming, 60,000; Temiskaming & Hudson Bay, 184,060. Total 1,369,788 pounds.

Cobalt Central—On the Bailey property operated under lease by this company some good finds have recently been made at 140 ft. from the Big Pete shaft on the first and second levels, and the same vein is showing up well at a depth of 180 feet.

Colonial—Development work has resulted in the discovery of large deposits of low-grade ore, with some of higher quality. Concentration has been decided on, and work is temporarily suspended while a stamp mill and concentrator are being installed.

ONTARIO—SOUTH LORRAIN

Harris-Lorrain Syndicate—This property adjoining the Wettlaufer has a force of 18 men at work. Altogether 24 veins have been opened and three shafts have been started. Machinery will be ordered before spring.

Mexico

CHIHUAHUA

Rio Plata—Manager D. W. Shanks' annual report to stockholders for the 11 months ending Nov. 30, 1908, contains the following items: Ore delivered to mill, 14,183 tons, of an average value of 90 oz. silver and total 1,296,470 oz.; shipping ore sorted, 90 tons of an average of 1502 oz. silver, and total 135,180 oz.; total stored in tailings pond on Nov. 30 of last year amounted to 14,616 tons containing 645,098 oz. silver. The total expenses are given as $100,886, or $7.113 per ton, and $0.1382 per oz. silver recovered. The net profits for the period were $248,608. The new cyanide plant will be in operation within three months.

International Gold Mines Company—This company is making ready its cyanide plant at the El Socorro mine in the Ocampo section for an extended experimental run on dump ores that are said to average $20 gold and silver to the ton. It is the plan to start regular milling on mine ores by the first of May. Col. J. W. Pender is the manager in charge of operations for this Kansas City company.

Rio Tinto—This company's lately blown in smeltery at Terrazas is turning out copper matte at the rate of about 12 tons daily. This output will be considerably increased as soon as minor difficulties at the works are overcome.

Laguna—Prospecting of an encouraging sort is carried on in a district west of Laguna, a station on the Mexican Central in the northern part of the state. The ores are mainly gold and silver-bearing copper and lead sulphides.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Feb. 3—The coal market in the West is reported as more active. Cold weather and storms throughout nearly all the western territory have stimulated sales and shipments of coal for domestic use. There is a little improvement in steam coal, but not to any marked degree. For the time being, however, dealers have enough to do to take care of domestic sales and are somewhat encouraged.

Coke shipments are showing a considerable increase, which is due to the greater activity at furnaces. There are more furnaces in blast now than for several months, while others are putting in stocks with the expectation of blowing in before long.

The Seaboard bituminous trade is quiet, sales of steam coal showing little improvement in the East. The anthracite trade is also quiet, but shipments continue fairly steady from the mines. It is still reported that much anthracite is going into stock as a provision against any contingencies which may arise next spring.

It was reported that the United States Supreme Court would this week give its decision on the appeal from the Circuit Court on the commodities clause of the Interstate Commerce law, which prohibits railroads from carrying coal which they own or mine. The Court, however, has adjourned for two weeks so that no decision will be handed down for that time. The Circuit Court, it will be remembered, decided that this clause of the law was unconstitutional.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Jan. 25, 1908, and Jan. 23, 1909, in short tons:

	1908.	1909.	Changes.	
Anthracite	353,966	302,763	D.	51,203
Bituminous	2,237,985	2,175,888	D.	62,087
Coke	457,999	639,545	I.	181,546
Total	3,049,950	3,118,196	I.	68,246

Average daily tonnage, 121,998 in 1908, and 135,574 in 1909; increase, 13,576 tons.

New York

Anthracite

Feb. 3—The cold wave from the West which reached New York this week, sending the thermometer down nearly to zero, gave a temporary lift to the retail trade. It has not yet, however, touched the wholesale business; whether it does or not depends upon how long it continues, which at the present writing seems very uncertain. Otherwise there is no change from the dullness which has prevailed for some time.

Prices are unchanged. The list prices for prepared sizes are $4.75 for broken, and $5 for egg, stove and chestnut. Small steam sizes are: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor points.

Bituminous

Business in soft coal is still very quiet, with irregular increases followed by quick decreases. The far East is not taking any more coal, but there is a little business along the Sound. New York harbor is still dull. There is no pressure to sell coal, however. Good grades of steam coal can be bought at $2.40@2.50 and gas coal at $2.25 for run-of-mine. Gas slack is still in some demand.

All-rail trade continues to be better than tidewater, though it is not extremely active. Cars are abundant but the railroads are taking matters quietly and are not pushing transportation.

In the Coastwise trade little is doing and rates are still pegged at about 75c. to around the Cape. The Department of Commerce and Labor has issued an order limiting the size of tows to three barges and the length of towing lines to 75 fathoms. This is the result of many complaints of the danger to navigation resulting from long tows. It may have the result of increasing Coastwise freight rates by barge.

Birmingham

Feb. 1—The Alabama coal trade is not very active just now. A number of mines in this State have been running on short time; in fact a movement was started among the coal operators recently to curtail the production in order that the output might be held down to something near the demand. There has been no change as yet in coal prices. The loss of the Louisiana trade, which had come to the rescue of this district, is being felt.

The coke production is being maintained at the top notch. What coke is not being consumed immediately is being stacked, as the indications point to a need of the product. Coke prices remain firm.

Chicago

Feb. 1—Another cold wave has stirred up the demand for domestic coals, and sales have been brisk. The market is closely responsive at this stage of the winter to weather changes, but dealers and consumers seem to have concluded that the winter will be open but for an occasional cold wave, and cease buying as soon as the mercury ascends. Steam coals are less affected and the consumption of western steam grades is steady and probably is increasing slightly. Screenings, highly important in the steam trade, have become firmer and lump has weakened, in the last week. In the domestic trade the demand is largely for low-priced coals.

Illinois and Indiana lump sells for $1.75@2.55, run-of-mine for $1.60@1.75 and screenings for $1.35@1.60. Eastern coals continue sluggish partly because of the turning of consumers to lower-priced Western coals, and partly because of large shipments that depress the market. Smokeless continues in overabundance with run-of-mine selling for $2.75@2.85 and lump at $3.20@3.65, for Pocahontas and New River. Hocking is cut 25 or 30c. under the circular price of $3.15 and has been in too large supply. Youghioghney is quiet at $3.15, movement being restricted to contracts, chiefly.

Anthracite is decidedly better as a result of the last cold wave, but was lifeless just before that. Retailers' bins are not holding any considerable supplies in city or country, but the wholesale supply is abundant and leads everybody to delay buying until the moment of need.

Pittsburg

Feb. 2—Coal shipments to southern ports have stopped, as the rivers have fallen to below a barge stage. It is expected that the rivers will be navigable again before the end of the month. On this rise fully 10,000,000 bu. of coal were shipped. All the river mines are in operation, but the railroad mines are being run irregularly. One independent company is running at about 60 per cent. of capacity, but the general average of operations of railroad mines is not at more than 25 per cent. of normal production. Prices remain unchanged on the basis of $1.15 a ton for mine-run coal at mines; slack continues around 75c. Some large transactions in slack are reported this week.

Connellsville Coke—Coke prices for prompt shipment have declined and some low rates have been named. Sales of furnace coke for spot are reported at $1.60 a ton and even less although a number of the large producers are holding

firmly at $1.75 for spot and $1.90@2 on contract. A number of plants have been closed and production is being curtailed by some producers who are running their works but five days a week. Foundry coke for spot shipment has dropped to $2, but in some instances $2.15 has been paid. On contracts for deliveries running through the first-half quotations are still $2.25@2.40 at ovens. The *Courier* gives the production in both regions at 267,709 tons. The shipments amounted to 9825 cars as follows: To the Pittsburg district, 3497; to points west of Pittsburg, 5373; to points east of Connellsville, 955 cars.

Foreign Coal Trade

Nova Scotia Coal--Coal shipments from Nova Scotia mines, year ended Dec. 31, long tons:

Company:	1907.	1908.	Changes.	
Dominion	3,193,000	3,199,000	I.	6,000
Nova Scotia Steel	623,162	644,338	I.	21,176
Cumberland	276,549	362,339	I.	85,790
Acadia	321,192	320,122	D.	1,070
Inverness	243,075	256,910	I.	13,835
Intercolonial	274,388	244,897	D.	29,491
Total	4,931,366	5,027,606	I.	96,240

The total coal mined, including that used and sold at mines, in 1908 was, by counties: Cape Breton, 3,930,000; Pictou, 599,000; Cumberland, 467,000; Inverness, 354,000; total, 5,350,000 tons, an increase of 187,000 tons, or 3.6 per cent., over the previous year.

The output of the Crow's Nest Pass Coal Company, British Columbia, for the year ended Dec. 31 was, in long tons:

	1907.	1908.	Changes.	
Coal	981,939	986,230	I.	4,291
Coke	231,368	269,944	I.	38,576

The December output is estimated on the actual production for two-thirds of the month.

United States Coal Exports—Exports of fuel from the United States, year ended Dec. 31, long tons:

	1907.	1908.	Changes.	
Anthracite	2,698,072	2,752,358	I.	54,286
Bituminous	10,454,677	9,100,819	D.	1,353,858
Total coal	13,152,749	11,853,177	D.	1,299,572
Coke	874,689	622,228	D.	252,461

Coal furnished to steamships in foreign trade not yet ascertained. Canada took in 1908 a total of 9,252,943 tons of coal. The decrease in coal in 1908 was 9.9 per cent.; in coke, 28.9 per cent.

United States Coal Imports—Imports of fuel into the United States, year ended Dec. 31, long tons:

	1907.	1908.	Changes.	
Anthracite	9,896	16,483	I.	6,587
Bituminous	2,116,122	1,487,116	D.	629,006
Total coal	2,126,018	1,503,599	D.	622,419
Coke	132,536	129,591	D.	2,945

Canada furnished 1,107,737 tons of coal and nearly all the coke in 1908; Australia, 327,441 tons of coal. Imports are mainly on the Pacific Coast. The decrease in coal in 1908 was 29.3 per cent.; in coke, 2.2 per cent.

Spanish Coal Imports—Imports of coal into Spain 11 months ended Nov. 30 were 1,760,969 metric tons, a decrease of 23,618 tons; imports of coke, 255,023 tons, an increase of 27,371 tons.

German Coal Syndicate—The Rhenish-Westphalian Coal Syndicate, which handles about 55 per cent. of the coal output of Germany, has made public its figures for 1908. The principal results are as follows, in metric tons:

Coal:	1907.	1908.	Changes.	
Production	80,156,000	81,921,000	I.	1,765,000
Sales	80,147,000	79,884,000	D.	263,000
Coke sales	15,535,500	12,820,800	D.	2,714,700
Briquet sales	2,860,100	3,129,200	I.	269,100

The efforts made to increase export sales, in order to compensate for reduced house consumption met with little success.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on Jan. 22: Best Welsh steam, $3.48; second, $3.36; thirds, $3.24; dry coals, $3.60; best Monmouthshire, $3.18; seconds, $3.06; best small steam, $2.04; seconds, $1.74. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Feb. 3—The iron and steel markets generally show little or no improvement over the last report. They are still in a waiting condition. This condition is emphasized by a very general impression in the trade that a general reduction in prices may be looked for before long.

In pig iron comparatively little new business has been done. Most of that going is in basic iron, and there is manifest some disposition on the part of furnaces to accept a lower price in order to secure orders. Thus, some considerable sales of basic are reported at $17 for Seaboard delivery or $16 at Pennsylvania furnaces. A considerable order for foundry, the largest of the week, is reported taken at $16.95 for No. 2X, Seaboard delivery.

Finished material is dull, except for structural material, in which small orders have been placed, making up a considerable total tonnage. Most of these have been taken by contracting companies at rates which imply a cut in material prices.

Orders for rails are not coming. The Pennsylvania Railroad Company has placed orders for 2200 steel cars for its lines west of Pittsburg, the order being divided among the following companies: Cambria Steel, 1000; Pressed Steel Car, 500; American Car and Foundry, 600; Standard Steel Car, 100 cars.

Pig Iron and Steel Production—As stated in detail elsewhere, the production of pig iron in the United States in 1908 was 15,936,018 long tons, a decrease of 9,845,343 tons, or 38.1 per cent., from 1907. The production of bessemer steel was 6,116,755 tons, a decrease of 5,550,754 tons, or 47.5 per cent.

Lake Superior Corporation—A reorganization of this company has been effected, which includes the investment of $6,000,000 of British capital in the allied industries of Sault Ste. Marie. The new interests are represented by Robert Fleming, of Edinborough and London, and Dr. F. S. Pearson, of London and New York. It is understood that the general direction of the affairs of the corporation will be intrusted to Dr. Pearson, who is prominent in connection with several Canadian industrial enterprises, being a director of the Dominion Iron and Steel and the Dominion Coal companies. The plans in contemplation include extensive additions to the blast furnaces and mills at the Sault, and the extension of the Algoma Central railway to connect with the Grand Trunk Pacific. Close investigation of the condition and possibilities of the company will be made by Dr. Pearson before the course to be pursued is finally determined. The last installment of the loan of $2,000,000, guaranteed by the Ontario government in 1904, of which $1,000,000 remained due, was repaid on Jan. 13, and the guarantee canceled.

Baltimore

Feb. 2—Exports from this port during the week included 1,575,600 lb. steel billets to Glasgow, Scotland.

Birmingham

Feb. 1—The aggregate business of the past month will equal the production and the greater portion of the trading was done on the basis of $13 per ton, No. 2 foundry. There was some iron sold under $13. Since that time there has been a strengthening in the quotations and the new month is opening up with $13 asked on all sides. The shipments of iron have been steady while the home consumption is beginning to show improvement. The cast-iron pipe makers have purchased recently to tide them over a little period. Their trade is healthy. The machine shops and foundries are doing better. The steel plant at Ensley is working practically in all departments and the output is satisfactory. There is a good demand for all shapes of steel, and so far as can be learned there have been no concessions made in this line in this district.

Chicago

Feb. 1—Dulness continues in the iron market. Pig iron sales are confined to needs of the immediate future—30 to 90 days from the date of the sale. The needs of melters probably are increasing slightly, but they are buying more closely to current requirements than in the closing months of 1908. By some observers of the market this condition is ascribed to the uncertainty of the trade about tariff re-

vision. It seems more generally evident now, however, that the revival of business will be slow and the foundryman has learned caution. The size of lots varies from a carload up to 200 or 300 tons, on the great bulk of the business. Inquiries have fallen off in number and are not for large individual amounts.

To say that prices are holding firm is to say that for much of the business now being done $13 Birmingham ($17.35 Chicago) for Southern and $17.50 Chicago for Northern No. 2 pig iron is doubtless being obtained. There can be no doubt, however, that on some business 25c. less is the price and any prospect of a transaction in which a large amount of tonnage would be concerned would bring 50c. less —perhaps even a lower price. This obtains more closely on Southern than Northern, the production of the latter being well restricted.

Iron and steel products are quiet, though there is considerable structural tonnage in sight and merchant steel is in fair demand. Coke is steady, shipments from the ovens being held down. Connellsville holds up to $4.75 or more.

Philadelphia

Feb. 3—The makers and agents of furnaces report a quiet and unsatisfactory market. The only exception is a little temporary activity in basic and bessemer, the aggregate of which may reach 15,000 tons with inquiries amounting to that much more. All other kinds of crude iron are neglected. The consumption of material for cast pipe is heavy and there are inquiries from pipe works but they are not likely to result in business very soon unless makers shade prices. Strong concerns in this territory are not making any effort to get business. Foundrymen are buying very little this month.

Steel Billets—Further business on a small scale is reported this week, including a few lots of forging billets. Prices hold their own.

Structural Material—Large orders for structural material are coming along, and are taken at cut prices. A general improvement is believed to be at hand in this branch.

Rails—Good sized orders for mine rails continue to come.

Scrap—Interest in scrap has again subsided, and dealers are not able to report any business of importance.

Pittsburg

Feb. 2—There has been no improvement in the iron and steel markets and the prospects seem to be getting worse instead of better. The general situation is extremely disappointing and consumers and jobbers are only buying for immediate requirements. Mill operations, however, do not show much falling off, although in some lines the large concerns have been compelled to curtail production. The uncertainty regarding the proposed revision of the tariff, together with persistent rumors of a probable general readjustment in prices are assigned as the reasons for the delay in placing large orders. It is known that the independent interests are cutting prices on sheets, plates and structural shapes, but the Steel Corporation concerns, the Jones & Laughlin Steel Company and the Republic Iron and Steel Company are adhering strictly to the established prices. Representatives of the large interests deny that any price reduction is contemplated, but the rumors are sufficient to cause consumers to hold off. The heavy buying of the jobbers that usually occurs at this season of the year has not materialized and the outlook is not regarded as particularly bright except in wire products and tinplate.

Pig Iron—The market is unusually irregular and former quotations are ignored by furnaces and dealers in efforts to get what little new business is offered. Some of the large producers are trying to maintain prices, but without success. An indication of the condition of the market may be found in a sale of 300 tons of No. 2 foundry made to a Pittsburg interest for delivery in the second quarter. A number of the dealers were after the business, one of them bidding $15, Valley furnace, but did not get the contract, as it went at a lower price. Bessemer iron can be had for first quarter shipment at $16 at furnace, and while basic is quoted at $15.50 and malleable bessemer at $15.75, it is believed that if any business was offered fully 50c. a ton less could be easily done. Gray forge is quoted nominally at $14.50. These prices are all at Valley furnaces.

Steel—A sale of 2000 tons of billets last week is the only new business in crude steel. Prices on bessemer and open-hearth billets remain at $25, Pittsburg, with freight divided. Plates are still quoted at 1.60c., but this price is being shaded. Merchant steel bars at 1.40c. are firm.

Sheets—Some new business is coming out almost every day, but it is being taken by independents at low prices. Regular quotations continue, black sheets, 2.50c. and galvanized 3.55c. for No. 28 gage.

Ferro-Manganese—Prices are weak, quotations for prompt shipment being $45.50@46 a ton.

Foreign Iron Trade

As reported by the American Iron and Steel Association, the total production of all kinds of pig iron in Canada in 1908 amounted to 563,672 tons, against 581,146 tons in 1907, a decrease of 17,474 tons, or about 3 per cent. In the first half of 1908 the pig-iron production of Canada amounted to 307,074 tons and in the second half to 256,598 tons, a decrease of 50,476 tons.

German Iron Production—The German Iron and Steel Union reports pig-iron production of the German furnaces in December at 1,016,526 metric tons, an increase of 85,788 tons over November. For the 12 months ended Dec. 31 the total make was, in metric tons:

	1907.	1908.	Changes.
Foundry iron	2,259,416	2,254,644	D. 4,772
Forge iron.....	786,113	635,228	D. 150,885
Steel pig.....	1,034,650	934,940	D. 99,710
Bessemer pig.....	471,355	361,472	D. 109,883
Thomas(basic)pig	8,494,226	7,627,227	D. 866,999
Total.....	13,045,760	11,813,511	D. 1,232,249

The total decrease in 1908 was 9.4 per cent. Steel pig includes spiegeleisen, ferro-manganese, ferrosilicon and all similar alloys. The lightest decrease was in foundry iron.

Metal Market

New York, Feb. 3—The metal markets continue in a rather depressed position, the January results having been generally unfavorable. Copper is governed largely by the European markets.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1908..	$ 7,358,707	$ 5,122,538	Exp. $2,235,169
" 1907..	1,004,441	44,448,515	Imp. 43,444,074
Year 1908..	71,215,456	50,246,099	Exp. 30,969,357
" 1907..	55,215,681	143,398,072	Imp. 88,182,391
Silver:			
Dec. 1908..	4,726,289	4,382,290	Exp. 343,999
" 1907..	4,413,698	4,222,036	" 191,662
Year 1908..	51,837,671	42,196,966	" 9,640,705
" 1907..	61,625,866	45,912,360	" 15,713,506

Exports from the port of New York, week ended Jan. 30: Gold, $1,150,000, chiefly to Panama and Argentina; silver, $1,070,594, chiefly to London. Imports: Gold, $41,163; silver, $18,183, both from the West Indies and South America.

No gold has been taken this week in New York for export to Europe. A total of $1,750,000 has, however, been shipped to Argentina on London account.

Gold—The price of gold in the open market in London has fallen off slightly this week, bar gold being quoted at 77s. 9d. per oz., and American eagles at 76s. 4d. The Bank of France has stopped buying gold for the present, being apparently satisfied with its reserve holdings, now that the Russian loan has been financed. Nearly all the gold bought in London this week was taken by the Bank of England.

Platinum—There is no change in prices, dealers in New York quoting $23.50@24.50 per oz. for refined platinum, $26.50 for hard metal and $19@21 for scrap. The market is very dull, with light sales.

Silver—The market has ruled steady the past week and closes firm at 24d. in London on buying by Chinese banks.

SILVER AND STERLING EXCHANGE

Jan.-Feb.	28	29	30	1	2	3
New York....	51⅜	51⅛	51⅞	52⅛	51⅞	52⅛
London.....	23⅛	23¾	23⅞	24	23⅞	24
Sterling Ex..	4.8740	4.8765	4.8770	4.8775	4.8770	4.8765

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Shipments of silver from London to the East, year to Jan. 21, reported by Messrs. Pixley & Abell, London:

	1908.	1909.	Changes.
India... ...	£ 298,000	£ 216,110	D. £ 81,890
China, ...	91,000	80,000	D. 11,000
Straits.....	.....	61,000	I. 61,000
Total.....	£ 389,000	£ 357,110	D. £ 31,890

Imports for the week, £200,000 from New York; exports, £61,000 coin to the Straits, and £110,000 bars to India; £171,000 in all.

Copper, Tin, Lead and Zinc

Jan.-Feb.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Spel'r. New York, Cts. per lb.
28	13¾ @14	13¼ @13⅜	58⅞	27⅝	4.12½ @4.17½	3.97½ @4.00	5.07½ @5.10
29	13¾ @14	13¼ @13⅜	58¼	27⅛	4.12½ @4.17½	3.97½ @4.00	5.07½ @5.10
30	13¾ @14	13¼ @13⅜	....	27⅛	4.12½ @4.17½	3.97½ @4.00	5.07½ @5.10
1	13¾ @13¾	13⅛ @13⅜	57⅞	27¼	4.10 @4.15	3.95 @4.00	5.05 @5.07½
2	13⅝ @13¾	13⅛ @13⅜	58¼	27¾	4.10 @4.15	3.95 @4.00	5.05 @5.07½
3	13¾ @13¾	13¼ @13⅜	58⅞	27⅞	4.10 @4.15	3.95 @4.00	5.05 @5.07½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium. Spelter prices at St. Louis, Jan. 28-Feb. 3, were 0.15c. below New York.

Copper—The liquidation in the London market to which reference has previously been made continued until Feb. 1. Since then there has been a better tone and reports from abroad are to the effect that the liquidation of speculative accounts appears to be completed for the time being. However, it is well known that speculative copper is still being carried both on this side and the other. Refined copper declined here in sympathy with Standard. Between Jan. 28 and 30 some fair sales, both of Lake and electrolytic, were made to domestic consumers. Since Monday, business has been of less amount, but at the close inquiries from abroad have been in the market. Late on Tuesday, the United Metals Selling Company announced a reduction of its price for electrolytic to 13½c., delivered, 30 days, but so far this has not resulted in bringing about an increase in buying. The close is uncertain at 13⅜@13¾c. for Lake copper; 13¼@13⅜c. for electrolytic in ingots, cakes and wirebars. The average of the week for casting copper is 13@13¼ cents.

Copper sheets, cold-rolled, 20c.; hot-rolled, 19c. per lb., base. Copper wire is ½c. lower, at 15¼c. base, carload lots at mill.

The Standard market turned weak again last Friday, and bordered on demoralization on Monday when £57 7s. 6d. for spot and £58 7s. 6d. for three months was reached. The liquidation having ceased, covering of short sales began on Tuesday, carrying prices up to £59 2s. 6d. for spot and £60 for three months. The close is again easier at £58 17s. 6d. for spot and £59 16s. 3d. for three months.

Refined and manufactured sorts we quote: English tough, £63; best selected, £62@63; strong sheets, £74@75.

January was a gloomy month in the copper market. During the first day or two round quantities were sold, but a quieter tone followed immediately, and then discouraging reports from Europe caused prices to give way, a fair tonnage being sold at the decline. In the latter half of the month the publication of exaggerated estimates of accumulated stock on this side led to liquidation in the London market of some of the large speculative accounts that had been carried for several months. This caused a break in the market for Standard, and thereafter the decline was rapid, both at London and New York. The London parity being below New York throughout the second half of the month, European consumers bought their supplies out of London warehouse and sales in New York for export were practically nil. This is reflected in the decrease in the statistics of visible supply reported from London, and in the falling off in exports from America. The exports reported were, of course, to a large extent copper sold in December and November. One of the large agencies, in particular, was successful in disposing of its January product during the big sales of early November, but the agencies generally were much less fortunate. Demand in January was small, and recognizing this, some of the sellers held aloof, maintaining a nominal asking price of 14½c., delivered, 30 days, but receiving no orders, while others were aggressive sellers at repeated concessions, capturing the business offered, which was chiefly for domestic account. The sellers of Lake being far less eager to realize, an unusually large disparity between the prices for Lake and electrolytic developed.

Exports from New York and Philadelphia for the week are reported at 3483 long tons copper. Our special correspondent gives the exports from Baltimore at 1074 long tons.

Copper exports in January were 18,540 long tons, against 21,590 in December.

Tin—In sympathy with copper, the tin market in London declined, reaching its lowest point on Feb. 1 at £123 15s. for spot and £125 10s. for futures. Some demand which was brought about by the lower values in this market and inquiries which, in consequence, were cabled abroad, tended to stiffen values in London. The advance, however, was not maintained and the market closes flat at £126 2s. 6d. for spot and £128 for three months.

In New York, tin can be bought at the close at about 27⅞ cents.

Visible stocks of tin Feb. 21, reported in long tons:

	In Store.	Afloat.	Total.
London.....	8,994	4,128	13,112
Holland...	1,823	187	2,010
U. S., exc. Pacific ports	3,559	3,204	6,763
Total...	14,376	7,519	21,895

The total shows an increase of 1967 tons over the January report.

Exports of tin from the Straits, 11 months ended Nov. 30, long tons: United States, 9432; Great Britain, 38,206; other Europe, 7900; India and China, 2000; total, 57,538 tons, an increase of 2933 tons over the previous year.

Arrivals of tin at Pacific Coast ports, year ended Dec. 31, were 1943 long tons in 1907, and 1756 in 1908; a decrease of 187 tons.

Tin output of the Federated Malay States for the 12 months ended Dec. 31 is reported at 48,431 long tons in 1907, and 50,646 in 1908; an increase of 2215 tons.

Lead—The market is extremely dull and there is more lead pressed for sale than can be placed, so that prices have declined further and the market closes weak at 4.10@4.15c. New York, and 3.95@4c. St. Louis.

The London market is also somewhat lower and quotations are cabled at £13 for Spanish lead, £13 2s. 6d. for English lead.

Spelter—The metal, which has been held back in anticipation of a higher market, in view of the exorbitant prices which have ruled for ore, is now being forced for sale, due to a decline which has taken place in Joplin ore prices. Consumers show little interest, as the galvanizing business is less active. The close is weak at 4.90@4.92½c. St. Louis, 5.05@5.07½c. New York.

The London market is quoted at £21 for good ordinaries and £21 15s. for specials.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market is still quiet, with only moderate current sales. There is no material change in prices, 8⅛@8¼c. being named for Hallett's; 8@8⅛c. for Cookson's; 7½@7¾c. for ordinary brands.

Aluminum—The Aluminum Company of America continues to quote 24c. base for No. 1 ingots; 33@34c. base for sheets. Foreign metal is offered at 22c. for ingots, but can probably be had a shade lower for good orders.

Quicksilver—New York quotations are unchanged at $45@46 per flask of 75 lb. San Francisco prices are $45@46 for domestic orders, and $43@44 for export. The London quotation is £8 7s. 6d. per flask, with £8 6s. 3d. named by jobbers. Business is quiet.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, from 50c. for 2000-lb. lots up to 55c. for 500-lb. lots. These quotations are for spot nickel. The price for electrolytic is 5c. higher.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magnesium—This metal is offered in New York at $1.25 per lb. in 100-lb. lots. The price is $1.40 per lb. for 5-lb. lots.

Imports and Exports of Metals

Exports and imports of metals in the United States for the year ended Dec. 31 are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	301,080	97,636	Exp. 203,444
Copper, 1907....	234,619	113,181	Exp. 121,438
Tin, long tons....	244	36,832	Imp. 36,588
Tin, 1907.....	562	36,852	Imp. 36,290
Lead, short tons.	76,354	112,046	Imp. 35,692
Lead, 1907.....	51,502	79,815	Imp. 28,313
Spelter, sh. tons.	2,640	881	Exp. 1,759
Spelter, 1907....	563	1,778	Imp. 1,215
Nickel, lb.....	9,770,248	16,586,423	Imp. 6,816,155
Nickel, 1907....	8,772,578	18,418,305	Imp. 9,645,727
Antimony, lb.....	.....	8,114,651	Imp. 8,114,651
Antimony, 1907.	.....	8,662,683	Imp. 8,662,683
Platinum, oz.....	... .	49,868	Imp. 49,868
Platinum, 1907.	..... .	74,208	Imp. 74,208
Quicksilver, lb...	224,692	.....	Exp. 224,692
Quicksilver, '07	384,913	.....	Exp. 384,913
Aluminum, value	$330,092	.....	Exp. $330,092
Aluminum, 1907	304,938	.....	Exp. 304,938
Ores, etc.:			
Zinc oxide, lb...24,016,054	.....		Exp.24,016,054
Zinc oxide, '07..26,512,920	.....		Exp.26,512,920
Zinc dross, lb....16,810,259	.....		Exp.16,810,259
Zinc dross, '07..19,186,737	.....		Exp.19,186,737
Zinc ores, lg.tons	23,311	49,996	Imp. 26,685
Zinc ores, 1907.	18,171	.....	.....
Antim'y ores, lb.	.....	3,280,922	Imp. 3,280,922
Ant. ores, 1907.	.....	2,780,186	Imp. 2,780,186

Copper, lead and nickel include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Imports of zinc ores in 1908 were 21,012 tons calamine and 26,984 tons other ores; in 1907 only partially reported.

Spanish Metal Exports

Exports of metals and ores from Spain, 11 months ended Nov. 30, metric tons, as reported by *Revista Minera*:

Metals:	1907.	1908.	Changes.
Copper.....	8,258	13,109	I. 4,851
Copper precipitate.	16,845	18,020	I. 2,175
Zinc	1,321	1,386	I. 65
Lead.....	164,495	171,846	I. 7,351
Quicksilver.....	1,500	1,504	I. 4
Minerals:			
Iron ore.....	8,108,251	6,780,388	D. 1,327,863
Copper ore.....	1,115,252	1,096,905	D. 18,327
Zinc ore.....	143,834	118,736	D. 25,098
Lead ore.....	5,116	2,926	D. 2,190
Manganese ore.....	62,368	20,957	D. 41,411
Pyrites.....	1,216,929	1,299,312	I. 82,383

Exports of salt, 452,758 tons in 1907, and 518,191 in 1908; increase, 65,433 tons.

Zinc and Lead Ore Markets

Joplin, Mo., Jan. 30—The highest price paid for zinc sulphide ore on this week's market was $43 per ton, the base ranging from $37 to $40 per ton of 60-per cent. zinc. Zinc silicate sold on a base of $19 to $21 for 40 per cent. zinc, and as high as $26 per ton. Average, all grades $36.58. Lead was largely sold this week on a base price also, offerings of $54 per ton of 80-per cent. lead being made, running the high price to $56. Average, all grades, $52.92 per ton.

Four days of the week were ideal for outputting, but a severe storm formed Thursday, the temperature changing to below zero. A tornado swept the district for 24 hours, the gale reaching, at times, as high as 50 miles per hour. Many tail elevators and smokestacks were leveled, and in some instances the falling elevators crushed in a portion of the mills. It is estimated the output was decreased this week approximately 8 per cent., and it may decrease next week's output 12 to 15 per cent.

SHIPMENTS, WEEK ENDED JAN. 30

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,343,060	933,000	$88,243
Joplin.....	1,620,710	253,720	39,139
Miami.....	351,150	425,580	16,543
Galena.....	553,280	145,020	14,355
Alba-Neck.....	601,540	.....	11,428
Granby	764,290	1,000	10,101
Spurgeon.....	473,230	86,050	9,504
Duenweg.....	531,200	.....	9,477
Aurora.....	483,240	.....	8,963
Prosperity.....	343,540	.....	6,526
Carthage.....	256,750	.....	5,135
Badger.....	194,710	.....	3,699
Sarcoxie.....	160,750	.....	2,577
Carl Junction.....	86,520	15,050	2,121
Zincite.....	95,020	.....	1,805
Oronogo.....	72,510	.....	1,247
Cave Springs.....	62,740	.....	1,192
Totals	9,994,840	1,859,420	$232,055
Five weeks.....	49,952,400	6,924,260	$1,139,945
Five weeks 1908.....	35,479,300	4,704,070	742,352

Zinc value, the week, $182,832; the month, $958,137
Lead value, the week, 49,223; the month, 179,808

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January.....	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February....	36.63	.....	34.92	.....	49.72	.....
March.....	36.19	.....	34.19	.....	49.90	.....
April	35.40	.....	34.08	.....	52.47	.....
May	34.19	.....	33.39	.....	56.05	.....
June.....	33.06	.....	32.07	.....	60.48	.....
July	34.55	.....	31.67	.....	59.90	.....
August	36.53	.....	33.42	.....	60.34	.....
September ..	37.63	.....	34.44	.....	54.59	.....
October.....	35.95	.....	33.28	.....	52.63	.....
November...	39.13	.....	35.02	.....	54.53	.....
December...	42.75	.....	39.63	.....	49.68	.....
Year.....	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Feb. 3—The market as a whole has shown no signs of activity. Dealers are buying only according to their immediate needs.

Copper Sulphate—Demand is fair and trade conditions remain unchanged. Quotations are steady at $4.75 per 100 lb. for carload lots and up to $5@5.50 per 100 lb. for smaller parcels.

Arsenic—The market is dull, only a few small sales being reported. Quotations are 3@3⅛c. per lb. for white arsenic.

Nitrate of Soda—A good normal trade on this article has been done during the past week. Current quotations are 2.17½c. for spot and 2.15c. for futures, which are a shade higher than last week.

Imports and Exports—The imports and exports of chemicals and raw materials in the United States 12 months ended Dec. 31 were as follows:

	Imports.	Exports.	Excess.
Copper sulph. lb.		7,663,882 E.	7,663,882
Bleach, lb.....	74,692,059	121,511 I.	74,480,548
Potash salts, lb..	300,073,012	1,046,689 I.	299,026,323
Soda salts, lb....	11,366,614	838,852 I.	10,527,762
Acetate lime, lb.		56,703,015 E.	56,703,015
Nit. of soda, tons	310,713	9,955 I.	300,758
Phosphates, tons	26,734	1,228,989 E.	1,202,255
Sulphur, tons....	19,118	27,894 E.	8,766
Pyrites, tons.....	668,115	..... I.	668,115

Estimating sulphur contents of pyrites, the total sulphur imported was approximately 286,364 long tons.

Mining Stocks

New York, Feb. 3—The general stock markets have been somewhat irregular during the week, but on the whole rather dull. The volume of trading was not heavy at any time. A period of weakness was followed by some recovery, so that there was no marked change in quotations. The report that the Supreme Court decision on the commodity clause of the Interstate Commerce law would be given out had some effect on the anthracite coal stocks; but the postponement of the decision affected them but slightly.

On the Curb the copper stocks developed some weakness, but recovered at the close. They were not especially active, the whole market being inclined to quiet. Cobalt stocks were sluggish, with no material change in prices. The Nevada gold stocks were inclined to be dull, and business in them was not heavy.

Boston, Feb. 2—It would seem as if copper mining shares had been sold almost to a standstill. After a sharp break, which extended pretty much through the entire list, prices recovered as sharply, although net declines are to be recorded for the week as a rule. The decision by the Cincinnati Court of Appeals in favor of the Calumet & Hecla proved a fillip and prices responded readily under the leadership of Osceola and Calumet & Hecla. Concentrated buying in Isle Royale caused an advance from $24 to $26.75 even while the balance of the market was weak. Conferences between the Calumet & Hecla and Osceola people were continued and again discontinued without accomplishing anything. Report says that Mr. Bigelow demands $8,000,000 to capitulate.

Allouez had a $6 spurt Monday to $40, and closes the week with a net advance of $6.75. The striking of the Kearsarge lode with rich formation was responsible for this. Calumet & Arizona had a bad break from $110 to $97, but rallied to $103.75 tonight. Amalgamated fell $5.75 to $72.75, rallying to $75.37½, and Copper Range broke $5.75 to $71.25, recovering to $74.25. North Butte broke $7.75 to $70.50, rallying to $75.50. Osceola fell $7 to $123, rallying to $133 on the Cincinnati decision, and Calumet & Hecla, after falling $25, to $625, rose to $640.

Superior Copper rose from $35.75 to $38.50. Utah Consolidated fell $3.75 to $39.75, rallying to $41.

Curb prices have been more regular and closed strong tonight.

STOCK QUOTATIONS

NEW YORK	Feb. 2	BOSTON	Feb. 2
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	¼	Adventure	8
Amalgamated	75⅛	Allouez	40½
Anaconda	45¼	Am. Zinc	‡24⅛
Balaklala	‡2¼	Arcadian	‡2¼
British Col. Cop.	7⅝	Arizona Com.	34⅞
Buffalo Mines	‡3¼	Atlantic	14¾
Butte Coalition	24	Boston Con.	14
Colonial Silver	⅛	Calumet & Ariz.	103¾
Cum. Ely Mining	8¼	Calumet & Hecla	640
Davis Daly	2⅛	Centennial	32
Dominion Cop.	¼	Con. Mercur	‡.30
Douglas Copper	2¼	Copper Range	74½
El Rayo	8¼	Daly-West	10¾
Florence	3⅛	East Butte	8¼
Foster Cobalt	.56	Franklin	15
Furnace Creek	.12	Greene—Can.	10⅝
Giroux	9	Isle Royal	26¼
Gold Hill	¾	La Salle	14
Goldfield Con.	7⅛	Mass	‡5¼
Granby	100½	Michigan	10½
Greene Gold	¼	Mohawk	61⅝
Greene G. & S.	7	Nevada	18
Greenw'r & D.Val.	‡.75	North Butte	75
Guanajuato	1¼	Old Colony	‡.60
Guggen. Exp.	181	Old Dominion	52
Hanapah	.15	Osceola	130
McKinley Dar.	1	Parrot	27¼
Miami Copper	13⅜	Quincy	89
Micmac	1¾	Rhode Island	5
Mines Co. of Am.	⅞	Santa Fe	‡2
Mitchell Mining	⅛	Shannon	15¼
Mont. Sho. C.	1¾	Superior	38½
Nev. Utah M. & S.	3⅛	Superior & Pitts.	15¾
Newhouse M. & S.	5¼	Tamarack	79
Nipissing Mines	9⅞	Trinity	15½
Old Hundred	1⅛	United Cop., com.	‡13½
Silver Queen	.87	U. S. Oil	‡29¼
Stewart	¾	U. S. Smg. & Ref.	41
Tennessee Cop'r.	40	U.S. Sm. & Re., pd.	45
Tri-Bullion	⅞	Utah Con.	41
Union Copper	1⅛	Victoria	4¼
Utah Apex	6¼	Winona	‡5
Utah Copper	41⅝	Wolverine	143
Yukon Gold	4¾	Wyandotte	2¾

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	38⅛
Am. Smelt. & Ref.	84¼
Am. Sm. & Ref. pf.	103
Colo. Fuel & Iron.	40
Federal M. & S., pf.	‡84
National Lead	78
National Lead, pf.	109¼
Pittsburg Coal	11⅞
Republic I. & S.	24⅛
Republic I. & S., pf.	85⅛
Sloss-Sheffield	76½
Standard Oil	649½
U. S. Steel	53
U. S. Steel, pf.	114⅞
Va. Car. Chem.	46

BOSTON CURB	
Ahmeek	‡145
Black Mt.	2⅞
Chemung	‡18
Globe Con	6¼
Hancock	‡11⅛
Helvetia	3¾
Keweenaw	‡4¾
North Lake	‡7½
Ojibway	12¼
Superior & Bost.	13½

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Jan. 30

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.07	.05
Center Cr'k	1.90	1.50
Cent. C. & C.	78.00	76.00
C.C. & C. pd.	81.00	80.00
Cent. Oil	120.00	110.00
Columbia	7.00	5.00
Con. Coal	20.00	19.00
Doe Run	120.00	110.00
Gra. Bimet.	.20	.18
St. Joe	14.00	12.00

LONDON Feb. 3

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 3 3
Camp Bird	0 16 0
Esperanza	3 0 9
Tomboy	0 18 9
El Oro	1 2 6
Oroville	0 9 3

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Feb. 3
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.08
Belcher	.32	St. Ives	.17
Best & Belcher	.51	Triangle	.02
Caledonia	.15	BULLFROG STOCKS	
Challar	.13	Gibraltar	.03
Comstock	.30	Homestake King	.07
Con. Cal. & Va.	.66	Mont. Shoshone C.	1.87½
Crown Point	.48	Tramp Cons	.09½
Exchequer	.35	MISCELLANEOUS	
Gould & Curry	.13	Bonnie Clare	.04
Hale & Norcross	.22	Lee Gold Grotto	...
Mexican	.82	Nevada Hills	1.37½
Ophir	1.55	Nevada Smelting	1.00
Overman	.14	Nevada Wonder	.35
Potosi	.18	Nevada-Utah	3.25
Savage	.26	Penn-Wyoming	.08
Sierra Nevada	.22	Pittsburgh S. Pk.	.78
Union	.34	Rawhide Coal	.44
Utah	.05	Round Mt. Sphinx	.07
Yellow Jacket	.74		
TONOPAH STOCKS			
Belmont	.80		
Extension	.48		
Golden Anchor	.01		
Jim Butler	.15		
MacNamara	.32		
Midway	.22		
Montana	.70		
North Star	.03		
Tono'h Mine of N.	6.00		
West End Con	.30		
GOLDFI'D STOCKS			
Adams	.03		
Atlanta	.13		
Booth	.22		
Columbia Mt.	.12		
Comb. Frac	1.14		
Con. Red Top	.12		
Cracker Jack	.03		
Dia'dfield B. B. C.	.06		
Goldfield Belmont	.05		
Goldfield Daisy	.74		
Great Bend	.19		
Jumbo Extension	.14		
Kendall	.07		
Lone Star	.06		
May Queen	.04		
N. Y. C. O. D.	.04		
Oro	.10		
Red Hill	.11		
Roanoke	...		
Sandstorm	.15		

COLO. SPRINGS Jan. 29

Name of Comp.	Clg.
Acacia	6¾
Black Bell	....
C. C. Con	3½
Dante	6¼
Doctor Jack Pot	8
Elkton	71
El Paso	48½
Findlay	16
Gold Dollar	9⅞
Gold Sovereign	3½
Isabella	26¾
Index	....
Jennie Sample	5
Jerry Johnson	‡4¾
Mary McKinney	‡35½
Pharmacist	‡3¾
Portland	1.00
Un. Gold Mines	4½
Vindicator	‡80
Work	7

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev.	Feb. 2	Feb. 23	$0.05
Bullion, Nev.	Feb. 24	Mar. 18	0.05
Gould & Curry, Nev.	Feb. 15	Mar. 9	0.10
Lady Washington, Nev.	Feb. 19	Mar. 12	0.05
Overman, Nev	Feb. 18	Mar. 11	0.10
Sierra Nevada, Nev.	Feb. 12	Mar. 5	0.10

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	.....	25.855	.....
March	55.365	.....	25.570	.....
April	54.505	.....	25.133	.....
May	52.795	.....	24.377	.....
June	53.663	.....	24.760	.....
July	53.115	.....	24.514	.....
August	51.683	.....	23.858	.....
September	51.720	.....	23.877	.....
October	51.431	.....	23.725	.....
November	49.647	.....	22.933	.....
December	48.769	.....	22.493	.....
Year	52.864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	61.197
February	12.905	.....	13.098	.....	58.786	.....
March	12.704	.....	12.875	.....	58.761	.....
April	12.743	.....	12.928	.....	58.331	.....
May	12.598	.....	12.788	.....	57.387	.....
June	12.675	.....	12.877	.....	57.842	.....
July	12.702	.....	12.933	.....	57.989	.....
August	13.462	.....	13.639	.....	60.500	.....
September	13.388	.....	13.600	.....	60.338	.....
October	13.354	.....	13.646	.....	60.139	.....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	.....
February	28.978	.....	August	29.942	.....
March	30.577	.....	September	28.815	.....
April	31.702	.....	October	29.444	.....
May	30.015	.....	November	30.348	.....
June	28.024	.....	December	29.154	.....
			Av. year.	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	3.691	4.175	14.469	13.113
February	3.725	.....	14.250	.....
March	3.838	.....	13.975	.....
April	3.993	.....	13.469	.....
May	4.253	.....	12.938	.....
June	4.466	.....	12.600	.....
July	4.447	.....	13.000	.....
August	4.580	.....	13.375	.....
September	4.515	.....	13.125	.....
October	4.351	.....	13.375	.....
November	4.330	.....	13.538	.....
December	4.213	.....	13.156	.....
Year	4.200	.....	13.439	.....

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	.....	4.638	.....	20.875	.....
March	4.665	.....	4.527	.....	21.075	.....
April	4.645	.....	4.495	.....	21.344	.....
May	4.608	.....	4.458	.....	19.906	.....
June	4.543	.....	4.393	.....	19.000	.....
July	4.485	.....	4.338	.....	19.031	.....
August	4.702	.....	4.556	.....	19.350	.....
September	4.769	.....	4.619	.....	19.563	.....
October	4.801	.....	4.651	.....	19.750	.....
November	5.059	.....	4.909	.....	20.875	.....
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	.....	4.578	.....	20.163	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ALUMINUM

8369—BRITISH WORKS—Three New British Aluminum Works. (Electrochem. and Met. Ind., Jan., 1909; 3¾ pp.) Describes the plants at Dolgarrog, Wallsend and Kinlochleven quite fully and gives many details of their operations. Special mention of the aluminum furnaces is made. The first two works belong to the Aluminum Corporation, Ltd., and the latter are being erected by the British Aluminum Co. 40c.

8370—CASTINGS—Production of Aluminum Castings. (Foundry, Dec., 1908; 6 pp.) Describes the manipulation of aluminum in the foundry and the practice of the Allyne Brass Foundry Co., probably the largest consumer of aluminum in the world. 20c.

8371—ELECTROLYTIC REDUCTION of Aluminum as a Laboratory Experiment. M. de Kay Thompson. (Electrochem. and Met. Ind., Jan., 1909; 2 pp.) Contains tabulated results of a series of laboratory experiments, and describes the difficulties encountered in attempting to electrolyze a solution of aluminum oxide in melted cryolite, according to the Hall patent. 40c.

AMMONIUM SULPHATE.

8372—PRODUCTION of Ammonium Sulphate. C. G. Atwater. (Am. Fertilizer, Dec., 1908; 5 pp.) A discussion of the production of ammonium sulphate as a by-product from coke ovens, giving tables of the world's output as well as consumption. 20c.

BARYTES.

8373—TENNESSEE—Barytes in Tennessee. A. H. Fay. (Eng. and Min. Journ., Jan. 9, 1909; ⅔ p.) A short review of the barytes industry in Tennessee during 1908. 20c.

BORAX.

8374—BORAX. (Eng. and Min. Journ., Jan. 9, 1909; ⅔ p.) A short review of the borax industry in California and the operations of the Pacific Coast Borax Company. 20c.

CALCIUM CYANAMIDE

8375—CALCIUM CYANAMIDE—On the Utilization of the Atmospheric Nitrogen in the Production of Calcium Cyanamide, and Its Use in Agriculture and Chemistry. Albert R. Frank. (Trans. Faraday Soc., Oct., 1908; 30 pp.) A historical résumé of the various attempts to produce calcium cyanide, together with tables showing its value as a fertilizer compared with other fertilizers now in use. Illustrated.

CEMENT

8376—CEMENT WORKS at Southam. (Engineer, Jan. 1 and 8, 1909; 4 pp.) A description of the cement works of Kaye & Co., Ltd., with plan and sectional drawings of the entire plant, including the two rotary kilns used. 60c.

8377—PORTLAND CEMENT INDUSTRY—A New Viewpoint of the American Portland Cement Industry. E. C. Eckel. (Eng. Rec., Jan. 9, 1909; 4 pp.) Paper read before the annual meeting of the Assn. of Am. Portland Cement Mfrs., in which the author discusses the future growth of the cement industry; possible price regulation; influence of patents; improvements in marketing conditions and the development of export trade. Illustrated. 20c.

COAL AND COKE

8378—ALBERTA—Coalfields of Alberta. Geo. B. Ellison. (Northwest Min. News, Jan., 1909; 2 pp.) The author gives a short discussion of the developments that are taking place in the Northwest. He considers that the coalfields of Alberta are very extensive. Illustrated. 20c.

8379—ANALYSIS—Some Fundamental Considerations on Coal. W. Jones. (Electrochem. and Met. Ind., Jan., 1909; 1 p.) This paper has special reference to the economic value of coal from the buyer's standpoint based upon the chemical analysis.

8380—AUSTRALIA—Coalfields and Collieries of Australia. F. D. Power. (Aust. Min. Stand., Nov. 4 and 18, 1908; 2 pp.) Continuation of article previously indexed. 60c.

8381—BRIQUETTED COAL—Comparative Tests of Run-of-Mine and Briquetted Coal on Locomotives. W. F. M. Goss. (Bull. No. 363, U. S. Geol. Surv., 1908; 57 pp.) A discussion of the briquet industry in Europe with tabulated results and comparative tests, together with chemical analyses. Also notes on foreign specifications for briquets. A short bibliography is attached. Illustrated.

8382—CANADA—The Mining Operations of the Dominion Coal Company. III and IV. F. W. Gray. (Can. Min. Journ., Dec. 15, 1908, and Jan. 1, 1909; 9 pp.) This article gives a short historical sketch of the early operations and a description of the present plant. Illustrated. 40c.

8383—CHARCOAL KILNS OF VARIOUS CONSTRUCTIONS—Hilding Bergström. (Jernkontorets Annaler, 1908; 42 pp.) Describes the various types of charcoal kilns employed in Sweden and discusses the output of charcoal and by-products and the economic results from their operation.

8384—CHINA—Coal Mining in China. T. T. Read. (Min. and Sci. Press, Jan. 2, 1909; 2½ pp.) Deals principally with the geographical distribution of the principal coal fields in China and gives a table of analyses of the various coals. Illustrated. 20c.

8385—COAL DUST—Appliances for Dealing with Coal Dust at the Pit Mouth. (Iron and Coal Tr. Rev., Jan. 8, 1909; 2 pp.) Translation of an article in "Glückauf." Gives drawings and descriptions of a number of coal dust extractors that are used at the various collieries of the Ruhr district. Illustrated. 40c.

8386—COAL DUST—Is Coal Dust, as Such, Explosive? Audley H. Stow. (Eng. and Min. Journ., Jan. 2, 1909; 3 pp.) A study of the chemical reactions that occur in dust explosions and a percentage estimate of fatalities due to falls of roof and side. 20c.

8387—COAL DUST—Spraying Coal Dust as a Colliery Safeguard. D. Harrington. (Eng. and Min. Journ., Jan. 23, 1909; 3 pp.) A description of an efficient sprinkling system, with detailed costs of installation and operation as carried on in the mines of Utah. Illustrated. 20c.

8388—COKE—Some Notes on Coking Plants. W. S. Mecartney. (Students' Magazine, Ballarat School of Mines. Vol. XI, No. 4, 1908; 3 pp.) The author discusses coal washing preparatory to coke manufacture, and points out that there is much room for improvement for the methods now in use in N. S. W., as none of the coking plants utilize the by-products. Illustrated. 40c.

8389—COMPOSITION OF COAL—Chemical and Physical Examination of Coals. (Aust. Min. and Eng. Rev., Dec. 5, 1908; 3 pp.) This article discusses the general methods used in determining hygroscopic water, volatile carbons, fixed carbon, ash, sulphur, and the composition of the ash. 40c.

8390—DISCIPLINE IN MINES. S. Reynolds. (Eng. and Min. Journ., Jan. 23, 1909; ⅔ p.) In this article the author emphasizes the fact that laws must be enforced and that punishment for violation should be severe. 20c.

8391—ELECTRIC POWER—The Distribution of Electric Power in Mines. (Iron and Coal Tr. Rev., Dec. 4, 1908; 1¼ pp.) This is essentially a description of a distribution board for the handling of high tension electric currents in the coal mines of Reyrolle & Co., Eng. Illustrated. 40c.

8392—ELECTRICITY—The Installation of Electricity in Coal Mines. W. A. Thomas. (Min. Wld., Dec. 26, 1908; 1½ pp.) A discussion of a set of rules governing electrical installation, particularly as to precautionary measures for the safety of employees. 20c.

8393—EXPLOSION at Benwell Colliery. R. A. S. Redmayne. (Min. Eng., Jan., 1909; 2 pp.) A description of the physical condition of the mine prior to the explosion and the tracing of the accident to the use of a gauzeless lamp. Illustrated. 20c.

8394—EXPLOSIONS—Views Respecting Coal Mine Explosions. (Eng. and Min. Journ., Jan. 2, 1909; 4¾ pp.) A symposium of opinions by Messrs Scholz, Virgin, Nelms, Butler and others. 20c.

8395—GREAT BRITAIN—The Coal and Coke Trades of the United Kingdom in 1908. (Iron and Coal Tr. Rev., Jan. 1, 1909; 6½ pp.) A general review of the commercial conditions, together with statistics of the output of the various districts, and diagrams showing the fluctuation in prices for the years 1907 and 1908. 40c.

8396—HOISTING—Electrical Winding in South Wales. (Elec. Rev., Jan., 1909; 4½ pp.) A description of the first electrically driven hoist installed by the Great Western Colliery in South Wales. Illustrated. 20c.

8397—ILLINOIS—The O'Gara Coal Company's Mines in Illinois. R. S. Moss. (Min. Wld., Dec. 19, 1908; 1¾ pp.) A description of the operations in the greatest coal producing section of the State. Extensive electric equipment recently installed. A comparison of this coal with the Hocking valley (Ohio) coals. Illustrated. 20c.

8398—MIDDLE WEST—Mining Industry of the Middle West. (Min. and Sci. Press, Jan. 2, 1909; 1½ pp.) This article deals principally with the coal mining industry in Illinois and vicinity. 20c.

8399—MINING METHODS for Maximum Recovery of Coal. H. V. Hesse. (Black Diamond, Jan. 16, 1909; 3 pp.)

The author discusses incompetent engineering and management; unfavorable labor conditions, and the importance of owners being able to obtain quick returns on their investment. Illustrated. 20c.

8400—MINING THIN SEAMS—Notes on Conveyor Working in a Thin Seam at Garesfield Colliery. P. E. Smallwood. (Iron and Coal Tr. Rev., Jan. 8, 1909; 1 p.) A description, together with drawings, of Blackett conveyors that are used in working a 22-inch seam of coal with a panel of blue clay-stone immediately above it. This system has been used since 1906 and has proved a profitable investment. Illustrated. 40c.

8401—NOVA SCOTIA—A Résumé of the Nova Scotian Coal Mining Industry for 1908. F. W. Gray. (Can. Min. Journ., Jan. 15, 1909; 3½ pp.) A description of the coal industry together with statistics showing the output of the principal companies for 1908. Also discusses the value of Nova Scotia coals as compared with those produced in the United States. 20c.

8402—NOVA SCOTIA—Explorations in Nova Scotia in 1907. Hugh Fletcher. (Dept. of Mines, Geol. Surv. of Canada, 1908; 15 pp.) A brief review of the explorations carried on in the coal districts of Nova Scotia during 1907.

8403—PUMPS—The Arrangement of Pumps for Modern Collieries—I. J. S. Barnes. (Iron and Coal Tr. Rev., Dec. 4, 1908; 2¼ pp.) In this article the Hawthorne-Davey pumps are described together with the general arrangement of a modern and up-to-date economical plant recently installed for handling 5000 gal. of water per minute. Illustrated; to be continued. 40c.

8404—ROOF SUPPORT—Notes on Roof Support, Other Than Timber, Practiced in the Pas de Calais Coal Field, North of France. J. E. Phelps. (Sci. and Art Min., Dec. 12, 1908; 1¾ pp.) A short discussion of the use of reinforced concrete in coal mining; also a brief note on the use of steel bridges. Illustrated. 20c.

8405—RUSSIAN COAL AND IRON INDUSTRY. (Iron and Coal Tr. Rev., Dec. 4, 1908; 1 p.) This article gives statistics and prices of the coal and iron industry in Russia for the year 1908. A brief résumé of the trade conditions. 40c.

8406—SAFETY LAMPS—German Tests with Igniters for Safety Lamps. (Coll. Guardian, Dec. 24, 1908; ½ p.) The author discusses the comparative safety of the phosphorus-cap, friction cap, electric methyl alcohol and cerium-iron alloy igniters. 40c.

8407—SCREENING PLANT—The Coal-Screening and Conveying Plant at the Collieries of Messrs. Burnyeat, Brown and Company, Nine Mile Point, near Newport, Monmouth. (Coll. Guard., Jan. 8, 1909; 2 pp.) Gives a description, with detailed drawings, of a screening plant having a capacity of 3000 tons per day. Illustrated. 40c.

8408—SOUTHERN STATES—The Coal Resources of the Southern States. E. W. Parker. (Mfrs. Rec., Jan. 7, 1909; 1 p.) A review of the early statistics of coal production in the Southern states with a short discussion of the coal reserves for the future. 20c.

8409—TESTS OF COAL AND BRIQUETS. D. T. Randall. (Bull. No. 366, U. S. Geol. Surv., 1908; 44 pp.) A discussion of the methods used and tabulation of results obtained on a series of tests of coal and briquets as fuel for housekeeping boilers. Illustrated.

8410—UNITED STATES—Coal Mining in the United States in 1908. (Eng. and Min. Journ., Jan. 9, 1909; 9 pp.) Reviews of mining conditions in many important centers of anthracite and bituminous production with forecast of future production. Statistics of the coal and coke output. 20c.

8411—UNITED STATES—The Coalfields of the United States. (Eng. and Min. Journ., Jan. 16, 1909; 4 pp.) A detailed map of the coalfields of the United States, accompanied by a description of the character of the coal, its geologic age, estimated tonnage in various fields. Illustrated. 20c.

8412—VENTILATION—The Principles of the Ventilation of Mines. W. H. Hepplewhite. (Coll. Guardian, Dec. 18, 1908; 1 p.) A discussion of the advantages to be obtained by splitting the air currents. 40c.

COPPER

8413—ARIZONA—The Turquoise Mining District, Arizona. J. M. Platt. (Eng. and Min. Journ., Jan. 23, 1909; ⅔ p.) A short description of the geology of the district, together with some notes on the operations of a number of the more important companies. 20c.

8414—BOSTON CONSOLIDATED MILL at Garfield, Utah. Leroy A. Palmer. (Min. Wld., Jan. 2, 1909; 3⅔ pp.) A short description of the ore deposits, transportation system and a flow sheet of the Boston Consolidated mill. A very complete description of the mill is given. Illustrated. 20c.

8415—CANADIAN COPPER COMPANY. D. F. Browne. (Can. Min. Journ., Jan. 15, 1909; 4 pp.) Gives a very complete description of the company's plant, and especially of the converter building and the furnaces. Illustrated. 20c.

8416—COLORADO—Some Copper Deposits in the Sangre de Christo Range, Colorado. Rufus M. Bagg, Jr. (Econ. Geol., Dec., 1908; 11 pp.) Gives a description of this range together with its geology, age and ore deposits. Illustrated. 60c.

8417—COPPER OUTLOOK. M. E. Appelbaum. (Min. and Sci. Press, Jan. 9, 1909; 1 p.) The author gives a brief résumé of the copper industry during 1908 and looks forward to a revival of business by the middle of 1909. 20c.

8418—COPPER SITUATION, The. James Douglas. (Min. and Sci. Press, Jan. 2, 1909; 1¼ pp.) A review of the copper industry for 1908. 20c.

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8420 — DESULPHURIZING — The Pot Roasting of Copper Ores. S. Radcliff. (Aust. Min. Stand., Dec. 2, 1908; 1¾ pp.) The author gives a description of a plant for desulphurizing copper ores at Wallaroo Smelting Works in South Australia. Illustrated. 40c.

8421 — ELECTRIC EQUIPMENT — Mansfeld, (Germany) Electrically Operated Copper Mines—I. Frank C. Perkins. (Min. Wld., Dec. 26, 1908; 2¾ pp.) This article deals principally with the utilization of furnace gases for generating electrical power to be used for pumping, hoisting, tramways, blowers and other purposes. Illustrated. 20c.

8422—KOREA—The Kosan Mine, Korea. A. D. Weigall. (Min. and Sci. Press, Dec. 26, 1908; 1¼ pp.) A history of the mine, together with a description of the copper deposits and table of ore analyses. Also a short note on the Tien Pae Shan copper mine in Kirin province. 20c.

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8424—NEVADA—Copper Mining at Ely, Nevada. C. DeKalb. (Min. and Sci. Press, Jan. 2, 1909; 3 pp.) A description of a copper mining plant in which the steam shovel is a very important factor. Illustrated. 20c.

8425—NEVADA'S GREAT COPPER CAMP. A Valjean. (Am. Min. Rev., Jan. 2, 1909; 1½ pp.) A short description of the Ely copper camp together with some notes on the McGill concentrator of the Cumberland-Ely mine, the Giroux Consolidated, the Boston Ely and the Copper Mines Company. Illustrated. 20c.

8426—NEW MEXICO—Mining and Milling Near Silver City, New Mexico. Robert B. Brinsmade. (Min. Wld., Dec. 26, 1908; 3¾ pp.) A history of the development of mining in the Apache country together with its geological features and transportation facilities. Also a description of the Santa Rita copper deposits and the equipment of the plant. Illustrated. 20c.

8427—PENNSYLVANIA — The Newark Copper Deposits of Southeastern Pennsylvania. Edgar T. Wherry. (Econ. Geol., Dec., 1908; 14 pp.) A historical sketch of the early operations together with the geology of the region. Gives a description of the ores associated with igneous rocks. Illustrated by map. 60c.

8428—PRODUCTION of Copper in 1907. L. C. Graton. (Advance Chapter from Mineral Resources of U. S., Calendar Year 1907; 78 pp.) A brief statement regarding the conditions of the copper industry; production by States; a description of the physical conditions existing in many of the prominent districts. Tables of imports and exports, also uses of copper and the prices.

8429—PRODUCTION—The Copper Production of North America. (Eng. and Min. Journ., Jan. 9, 1909; 7 pp.) A review of the commercial conditions for the year 1908, together with statistics of the output of copper in the principal mining districts. Illustrated. 20c.

8430—QUEENSLAND—Cloncurry Copper Mining District, Part I. L. C. Ball. (Queensland Geol. Surv., Pub. No. 215, 1908; 42 pp.) This report deals entirely with the geography, history, economics, geology and the copper ore deposits as occurring in this district.

8431—QUEENSLAND—Cloncurry Copper Mining District, Part II. L. C. Ball. (Queensland Geol. Surv., Pub. No. 215, 1908; 379 pp.) This part of the report is limited to individual descriptions of the mines. It gives the names of the operating companies together with detailed description of their operations. Illustrated.

8432—SLAG CAR Used at the Cananea Smelting Works. C. F. Shelby. (Eng. and Min. Journ., Jan. 23, 1909; 2 pp.) A description of a cast-steel bowl which has a capacity of 45 cu. ft. and is used for handling the slag from the Cananea Company's smelters. 20c.

8433—SMELTER CHIMNEY—New 500-ft. Chimney at Great Falls Smelter. Edwin Higgins. (Eng. and Min. Journ., Jan. 16, 1909; 3½ pp.) The largest chimney both in size and capacity in the world. Flue dust caught by network of wire suspended in dust chamber. Illustrated. 20c.

8434 — SMELTER FUMES — Copper Fumes Converted into a Fertilizer Ingredient. J. S. Grasty. (Mfrs. Rec., Jan. 7, 1909; 1 p.) A brief description of the sulphuric acid plant as recently constructed by the Tennessee Copper Company. 20c.

8435—SMELTING CONDITIONS at Salt Lake. C. De Kalb. (Min. and Sci. Press, Jan. 2, 1909; 3½ pp.) A review of the smelting industry and the economic conditions prevailing at Salt Lake. Illustrated. 20c.

8436—TENNESSEE COPPER COMPANY —Mines and Works of the Tennessee Copper Co. B. B. Gottsberger. (Min. Wld., Dec. 19, 1908; 3¾ pp.) A historical résumé of the Ducktown district and a description of its smelter, power plant and the sulphuric acid plant for utilizing the blast furnace gases. Illustrated. 20c.

GOLD AND SILVER.

8437—AFRICA—West Africa, the Gold Coast Colony and Ashanti in 1908. W. F. Wilkinson. (Eng. and Min. Journ., Jan. 23, 1909; 1 p.) A review of the operations of the Ashanti Goldfields Corporation and other companies during the year 1908, together with statistics showing the tonnage and value of the ores treated by the various companies. 20c.

8438—ALLUVIAL GOLD—Sources of Alluvial Gold. Walter F. Smith. (Aust. Min. Stand., Nov. 18, 1908; ⅔ p.) A short discussion of the origin of alluvial gold in the vicinity of Berlin, Victoria and Lisle, Tasmania. 40c.

8439—ALLUVIAL MINING—Two Problems in Alluvial Mining. Richard Hain. (Students Magazine, Ballarat School of Mines. Vol. XI, No. 4, 1908; 3 pp.) Discusses the drainage problem in alluvial deposits, and also mining costs. 40c.

8440—CALIFORNIA—Mining on the Mother Lode. E. W. Turner. (Min. and Sci. Press, Jan. 2, 1909; 1½ pp.) A short discussion of the geology and the ore deposits together with the value of the ore produced from a number of the principal mines. Illustrated. 20c.

8441—CENTRAL AMERICA—The Gold Regions of the Straits of Magellan and Tierra del Fuego. R. A. F. Penrose, Jr. (Journ. of Geology, Nov.-Dec., 1908; 15 pp.) A discussion of the geology and topography of the region, the discovery and distribution of the gold deposits; their occurrence and methods of prospecting. Illustrated. 60c.

8442—COLOMBIA—The Real Eldorado. F. L. Garrison. (Min. and Sci. Press, Jan. 2, 1909; 1¾ pp.) A short history of the early Spanish explorers in the vicinity of Bogota, Colombia. 20c.

8443—COLORADO—Cripple Creek in 1908. W. H. Travell. (Min. and Sci. Press, Jan. 2, 1909; 2½ pp.) A short description of the Portland, Stratton's Independence, Golden Cycle, Elkton, Vindicator and Mary McKinney mines. 20c.

8444 — CUPELLATION — Notes on Cupelling Gold-Lead Bullion. Geo. Melville. (Journ. Chem. Met. and Min. Soc. of South Africa, Nov., 1908; 2 pp.) The author gives a description of the method of cupelling gold-lead bullion as it comes from the pan furnace. 60c.

8445—CYANIDATION—A Simple and Effective Contrivance for Filtering Gold Slime. E. Jensen. (Monthly Journ. W. A. Chamber of Mines, Nov. 30, 1908; 2 pp.) The author discusses the value of the vacuum filtration process as a substitute for a filter press. Illustrated. 80c.

8446—CYANIDATION—Notes on Cyanidation. Leo D. Bishop. (Proc. Colo. Sci. Soc., Dec., 1908; 14 pp.) Discusses the effect of excess of lime and temperature upon the settlement of slime and gives results of some experiments on this subject. It also discusses the effect of using partially oxidized slacked lime and of unsuitable lime in cyanidation. C. W. Comstock in discussing Mr. Bishop's paper shows an apparent relation between the results of Mr. Bishop's experiment on settlement and Poisenille experiments on viscosity.

8447 — CYANIDATION — Progress in Cyanidation. Alfred James. (Min. and Sci. Press, Jan. 2, 1909; 6½ pp.) The author discusses the slime processes also the vacuum filtration and gives some notes on ore crushing. Illustrated. 20c.

8448 — CYANIDATION — The Adair-Usher Process. Alfred Adair. (Journ. Chem. Met. and Min. Soc. of South Africa, Nov., 1908; 4 pp.) Reply to a discussion of the above paper describing this process which was read at the May meeting, 1908. 60c.

8449—CYANIDATION—The Virginia & Mexico Cyanide Plant. Mark R. Lamb. (Eng. and Min. Journ., Jan. 16, 1909; 1 p.) A short description of the plant and method of operation. Illustrated. 20c.

8450—CYANIDATION—Zinc Dust Precipitation at Cerro Prieto. R. Linton. (Journ. Chem. Met. and Min. Soc. of South Africa, Nov., 1908; 1 p.) A discussion of the author's paper on this subject which was read at the September meeting, 1908. 60c.

8451 — ELECTRO-CYANIDE PROCESS—Operations of the Parks Electro-Cyanide Process. J. R. Parks. (Min. Wld., Jan. 23, 1909; 1½ pp.) The description of a process depending upon the solubility of the precious metals in cyanide solutions followed by electrolytic deposition. Illustrated. 20c.

8452—EXTRACTION—Improved Process for Extracting Metals in Ores. W. E. Greenawalt. (Min. Wld., Dec. 5, 1908; 1½ pp.) A chlorination process to be used on refractory gold ores depending upon the solubility of chlorine in water under various pressures. 20c.

8453 — FINE GRINDING — Laboratory Screens: Their Use in Testing the Efficiency of Grinding Machines. E. T. Henderson. (Aust. Min. and Eng. Rev., Nov. 5, 1908; 3¼ pp.) A discussion of the ratio of the mesh together with a proposed scheme for new ratio. 40c.

8454—FINE GRINDING—The Computation of Crushing Efficiency of Fine Grinding Machines. H. Stadler. (Journ. South African Assn. of Eng., Dec., 1908; 10 pp.) This article records a series of tests of tube mill grinding as compared with the fines obtained from the stamp mill. He gives a mathematical discussion of the question of efficiency. 80c.

8455—GOLD DREDGER PRACTICE in Placers of Breckenridge, Colo. A. Lakes, Jr. (Min. Sci., Jan. 14, 1909; 4 pp.) An outlined description of the arrangement and operation of gold dredges as practiced in Colorado's most extensively developed placer fields. Illustrated. 20c.

8456 — GOLD DREDGING — Bucket Dredging and Pump Sluicing. H. Herman. (Aust. Min. Stand., Nov. 18, 1908; 1 p.) The applicability and costs of bucket dredging as compared with pump sluicing. 40c.

8457—GOLD DREDGING—Developments in Gold Dredging in 1908. J. P. Hutchins. (Eng. and Min. Journ., Jan. 23, 1909; 3 pp.) A prosperous year in this industry as shown by great activity in California and important progress in the Klondike. 20c.

8458—GOLD DREDGING OPERATIONS in the California Fields. G. S. Cowdery and E. A. Sperry. (Min. Sci., Jan. 14, 1909; 4½ pp.) A brief account of the evolution of the dredge as used in placer work during the past eleven years, especially in the Sacramento and Feather river basins. Illustrated. 20c.

8459—GOLD DREDGING—The Recovery of Values from River Bottoms. W. D. Egilburt. (Min. Wld., Jan. 16, 1909; 1½ pp.) The author discusses dredging operations, together with the construction of dredges and gold saving devices. 20c.

8460—HYDRAULIC MINING—Examining and Fitting Up a Hydraulic Mine—II. H. A. Brigham. (Eng. and Min. Journ., Jan. 2, 1909; 6⅝ pp.) The construction of sluices, under-currents, grizzlies, flumes, penstocks and the building of ditches are discussed in detail. Illustrated.

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Grains	"	.10@.17
Corundum	"	.07@.10
Crushed Steel, f.o.b. Pittsburg	"	.05½@.06
Emery, in kegs: Turkish flour	"	.01½@.02½
Grains	"	.03½@.04½
Naxos flour	"	.01½@.02½
Grains	"	.03½@.04½
Chester flour	"	.01½
Grains	"	.03½@.04½
Peekskill, f.o.b. Easton, Pa., flour	"	.01½@.01½
Grains, in kegs	"	.02½@.03
Garnet, per quality	sh. ton	25.00@35.00
Pumice Stone, Am. Powd.,	100 lb.	1.60@2.00
Italian, powdered	"	.01½@.02
Lump, per quality	"	.03@.20
Rottenstone, ground	"	.01½@.04
Lump, per quality	"	.05½@.20
Rouge, per quality	"	.05@.30
Steel Emery, f.o.b. Pittsburg	"	.07½@.07¾
ACIDS—		
Acetic 28%	lb.	.021 up
Boric	"	.07
Hydrofluoric, 30%	"	.02½@.03
" 48%	"	.06
" 60%	"	.10
Hydrochloric acid, 20°, per lb.		1.25@1.50
Nitric acid, 36°	per lb.	.03½@.04½
Sulphuric acid, 50°, bulk per ton.		$12 up
60°, 100 lb. in carboys.		.85@1.12½
60°, bulk, ton		16.00@18.00
66°, 100 lb. in carboys.		1.00@1.25
66°, bulk, ton		18.00
Oxalic	"	.06½@.06½
ALCOHOL—Grain 95%	gal.	2.63
Denatured	"	.45@.47
Refined wood, 95@97%	"	.50@.55
ALUM—Lump	100 lb.	$1.75
Ground	"	1.85
Chrome Alum	"	.03½@.04
ALUMINUM—Sulphate, com'l.	lb.	1.10@1.75
AMMONIA—24 deg. lb	"	.04½@.05½
" 26 deg. lb		.04½@.05½
AMMONIUM—		
Bromide	lb.	.28
Carbonate	"	.07½@.09½
Muriate grain	"	.05½@.06½
Lump	"	.09½@.09½
Sulphate, 100 lb		3.05@3.10
Sulphocyanide com	"	.30
" chem. pure	"	.40
ANTIMONY—needle, lump	"	.04@.05½
ARSENIC—White	"	.03½@.03¾
Red	"	.07½@.07¾
ASPHALTUM—		
Barbadoes	per ton.	40.00@80.00
West Indies	"	20.00@60.00
Egyptian	lb.	.11@.14
Gilsonite, Utah ordinary	per ton.	32.00
Trinidad	"	22.50@30.00
California	"	21.00@27.00
BARIUM—		
Carb. Lump, 80@90%	lg. ton.	30.00@35.00
Precipitated 96@98%		36.00@40.00
Powdered, 80@90%	lb.	.02@.02½
Chloride com'l	ton.	37.00@39.00
Nitrate powdered, in casks	lb.	.05½@.06½
Blanc Fixe	per lb.	.02½
BARYTES—		
Am. Ground, prime	sh. ton.	16.00@17.00
Floated	"	17.00@18.00
Foreign floated	"	20.00@22.00
BISMUTH—Sub-nitrate	lb.	1.45
BLEACHING POWDER—35%, 100 lb		1.25@1.40
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.		4.75
BONE ASH	lb.	.02½@.04
BORAX, sacks	"	.04½@.05
CALCIUM—Acetate, gray, 100 lb		1.50@1.55
Acetate, brown	lb.	1.00@1.05
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton.	65.00
Chloride, f.o.b. N. Y.	"	11.00@14.00
CEMENT—		
Portland, Am. 500 lb	bbl.	1.55@1.60
Foreign	"	2.25@2.90
"Rosendale," 300 lb	"	.85
(in sacks)	"	.65
Slag cement	"	.75@1.25
CHROME ORE—		
New Caledonia 50% ex. ship N. Y.	per lg. ton.	17.50@20.00
Bricks, f.o.b. Pittsburg, M	ton.	175.00
CLAY, CHINA—Am. common ex-dock, N. Y.	ton.	8.00@9.00
Foreign	"	11.50@18.00
COBALT—Oxide	lb.	1.45@2.60
COPPERAS—Bulk	100 lb.	$0.55
In bbls.	"	.65@.75
In bags	"	.60@.70
CRYOLITE	lb.	.06½@.06¾
FELDSPAR—Ground best	sh.ton.	10.50@15.00
FIRE BRICK—		
American	per M.	30.00@40.00
Imported	"	30.00@45.00
St. Louis No. 1	"	18.00
" No. 2	"	15.00
Extra		20.00@23.00
FIRE CLAY—F.o.b. St. Louis.		
St. Louis, extra quality	per ton.	5.00
ordinary	"	2.50
Dowestic f.o.b. shipping port:		
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	lg. ton.	8.00@10.00
Ground	"	11.50@13.50
Foreign crude ex. dock		8.00@10.00
FULLER'S EARTH—Lump,	100 lb.	.80@.85
Powdered	"	.80@.85
GRAPHITE—Ceylon.		
Flying dust, finest to best	lb.	.02½@.04
Dust	"	.02½@.05
Chip	"	.04@.08
Lump	"	.05½@12
Large lump	"	.08½@.10½
GYPSUM—		
Feritlizer	sh. ton.	5.00
Ground	"	4.00@7.00
INFUSORIAL EARTH—		
Ground Am. Best	lb.	.01½
German	lb.	.02½@.02¾
LEAD—Acetate (sugar of) brown,	lb.	.07¾
Nitrate, com'l.	"	.08½@.08¾
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	8.00@10.00
Calcined, powdered	sh. ton.	26.00@35.00
Bricks, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	.90@1.25
Sulphate (Epsom salt)	100 lb.	.85@1.00
MANGANESE—		
Foreign, crude, powdered:		
70@75% binoxide	lb.	.01@.01½
75@85% binoxide	"	.01½@.01½
85@90% binoxide	"	.01½@.05
90@95% binoxide	"	.06½
Ore, 80%-85%	sh. ton.	16.00@32.50
MARBLE—Flour	sh. ton.	8.50@10.00
MINERAL WOOL—		
Slag, ordinary	sh. ton.	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
Selected	"	40.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, nominal	lb.	.08 and up
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		.47
Sulphate, single	lb.	.09@.11
Sulphate, double	"	.06½@.08
NITRATE OF SODA—100 lb. 95% for '08		2.17½
95% for 1909		2.17½
95% for 1910		2.17½
96% is 2½@7½c. higher per 100 lb.		
OZOKERITE—best	lb.	.14@.17
PAINTS AND COLORS—		
Litharge, Am. powdered	lb.	.06½@.07
English glassmakers'	"	.08½@.08½
Lithopone	"	.03½@.07
Metallic, brown	sh. ton.	16.50@22.00
Red	"	14.00@18.00
Ocher, Am. common	"	8.50@9.00
Best	"	16.00
Dutch, washed	lb.	.02½@.03
French, washed	"	.01½@.02½
Paris green, pure, bulk	"	.21½
Red lead, American	"	.06½@.07
Foreign	"	.08½@.08½
Turpentine, spirits bbl., per gal.		.45½
White lead, Am., dry	lb.	.05½@.05½
American, in oil	"	.06½@.06¾
Foreign, in oil	"	.10½@.10¾
Zinc white, Am. extra dry	"	.05½@.05½
French, red seal, dry	"	.08½@.08½
French, Green seal, dry	"	.10½@.10½
PHOSPHATES—Acid	57@60c. per unit	
*Fla., hard rock 77%		8.50@9.00
land pebble 68%		4.00@4.25
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. rock, dried		7.00@7.25
" " rock, undried		5.50@5.75
POTASSIUM—		
Bicarbonate crystal	lb.	$.08½@.09
Powdered or granulated	"	.09@.09½
Bichromate, Am.	"	.08½@.08½
Scotch	"	.10½
Bromide	"	.20
Carbonate (80@85%)	"	.03½@.04
Caustic, ordinary	"	.04½@.05½
Elect. (90%)	"	.05½@.06
Chloride (muriate), 100 lb	"	1.90
Chlorate, powdered	"	.09½@.09½
Crystals	"	09@09½
Cyanide (98@99%)		
Carloads (30,000 lb.)	"	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	20c.
Kainite, long ton, bulk, 8.25; bags, 9.50.		
Permanganate	lb.	.10@.11
Prussiate, yellow	"	.13@.13½
Red	"	.30@.35
Sulphate	100 lb.	2.18½@2.21½
PYRITE—		
Domestic, non-arsenical, furnace size, f.o.b. mines	per unit.	11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines		10@10½c
Imported non-arsenical, furnace size, per unit		.12½
Imported, arsenical, furnace size, per unit		.12
Imported fines, arsenical, per unit.		.08½@.09
Imported fines, non-arsenical, per unit		10½@11c.
Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.		
SALT—N. Y. com. fine	280 lb. bbl.	.72@1.13
N. Y. agricultural	sh. ton.	3.80@4.50
SALTPETER—Crude	100 lb.	4.00@4.50
Refined ,crystals	"	5.50@6.00
SILICA—		
Ground quartz, ord'ry.	lg. ton.	10.00@15.00
Silex, ground	"	13.00@15.00
Silex, floated	"	35.00@40.00
Lump quartz	"	5.00@6.00
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.33½@.36½
SODIUM—		
Acetate	lb.	.04@.04½
"Alkali," per 100 lb., 58/48		.80@.87½
Bicarb. soda, per 100 lb.		1.00@1.30c.
Soda, caustic, per 100 lb., 76/60		1.75@1.85
Soda, caustic, powdered		.02½@.03½
Salt cake, per 100 lb., bulk		.40
Salt cake, bbl		.65@.85
Soda, monohydrate, per lb.		1.4@1.75c.
Bichromate	lb.	.06½@.07
Bromide	"	.13@.14
Chlorate, com'l.	"	.09@.09½
Cyanide ("100% KCN")		
Carloads (30,000 lb.)	"	18c.
5-ton lots	"	18½c.
Less than 5 tons	"	19c.
Hyposulphite, Am.	"	1.35 up
German	"	1.60@1.70
Phosphate	100 lb.	2.25@2.50
Prussiate	"	.08@.08½
Sal soda, f.o.b. N. Y.	"	.60@.70
Foreign, f.o.b. N. Y.	"	.80@1.00
Silicate, com'l, liquid	"	.75@.90
Sulphate, com'l (Glauber's salt)	100 lb.	.60@.75
Sulphate, com'l, calcined	"	.65@.85
STRONTIUM—Nitrate	lb.	.07½@.08
SULPHUR—		
Louisiana (prime) to New York, Boston or Portland	lg. ton.	22.00
To Philadelphia or Baltimore	"	22.00
Roll	100 lb.	1.85@2.15
Flour	"	2.00@2.40
Flowers, sublimed	"	2.20@2.60
TERRA ALBA—French & Eng.	100 lb.	.80@1.00
TALC—Domestic	sh. ton.	15.00@25.00
French	"	18.00@25.00
Italian, best	"	25.00@40.00
TIN—Bi-chloride, 50%	lb.	.09½ up
Crystals	"	.21 up
Oxide, lb	"	.33@.35
URANIUM—Oxide	"	3.50
ZINC—		
Chloride solution, com'l 20°	"	.02½
Chloride, granular	"	.04½@.04¾
Dust	"	.05@.05½
Sulphate	"	.02@.02½

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites, and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their outputs as matters of private contract.

Mining and Metallurgical Companies—U. S.

Name of Company and Location.		Author-ized Capital	Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.	Amt.
Alaska Mexican, g.	Al'ka	$1,000,000	180,000	$ 5	$2,112,381	Jan. 1909	$ .40
Alaska Treadwell,g.	Al'ka	5,000,000	200,000	25	10,385,000	Jan. 1909	.75
Alaska United, g.	Al'ka	1,000,000	180,200	5	468,470	Jan. 1909	.25
Amalgamated, c.	Mont	155,000,000	1,538,879	100	69,249,554	Feb. 1909	.50
Am.Sm.&Ref.,com.	U. S.	50,000,000	500,000	100	15,500,000	Jan. 1909	1.00
Am. Sm. & Ref. pf.	U. S.	50,000,000	500,000	100	29,750,000	Jan. 1909	1.75
Am. Smelters, pf. A	U. S.	17,000,000	170,000	100	3,455,000	Dec. 1908	1.50
Am. Smelters. pf. B	U. S.	30,000,000	300,000	100	5,250,000	Dec. 1908	1.25
Am.Zinc,Lead&Sm.	Kan.	3,750,000	80,000	25	280,000	Nov. 1907	.50
Anaconda,c.	Mont	30,000,000	1,200,000	25	43,650,000	Jan. 1909	.50
Arizona, c.	Ariz	3,775,000	3,682,520	.....	6,182,361	Apr. 1906	.05
Atlantic, c	Mich	2,500,000	100,000	25	990,000	Feb. 1905	.02
Bald Butte, g. s.	Mont	250,000	250,000	1	1,354,648	Oct. 1907	.04
Beck Tunnel, g.s.l.	Utah	100,000	1,000,000	0.10	675,000	Oct. 1907	.02
Bent'nM.&D.,pf.,l.z.	Wis.	600,000	196,607	1	10,949	Nov. 1908	.01½
Boston & Montana.	Mont	3,750,000	150,000	25	52,950,000	Jan. 1909	3.00
Bull.Beck.&Cham.g	Utah	1,000,000	100,000	10	2,728,400	July 1908	.10
Bunker Hill & Sull.	Ida	3,000,000	300,000	10	10,746,000	Jan. 1909	.25
Butte Coalition,c.s.	Mont	15,000,000	1,000,000	15	2,450,000	Dec. 1907	.15
Calumet & Arizonac	Ariz	2,500,000	200,000	10	10,300,000	Dec. 1908	1.00
Calumet & Hecla,c.	Mich	2,500,000	100,000	25	107,850,000	Dec. 1908	5.00
Camp Bird, g., s.	Colo	5,500,000	820,000	5	5,510,400	Feb. 1909	.24
Cariss, c.g.	Utah	500,000	500,000	1	55,000	Nov. 1906	.01
Colorado, l. g. s.	Utah	200,000	1,000,000	0.20	1,100,000	Jan. 1909	.08
Columbus Con. c.	Utah	1,500,000	283,540	5	226,832	Oct. 1907	.20
Combi'tion Co.G'f'd	Nevada	400,000	320,000	1	688,000	Sept. 1906	.15
Con. Mercur, g.	Utah	1,000,000	1,000,000	1	3,385,313	Dec. 1906	.02½
Continental, z.l.	Mo.	550,000	22,000	25	231,000	Oct. 1908	.25
Copper Range Con.	Mich	40,000,000	384,185	100	7,683,700	Jan. 1909	1.00
Creede United, g.	Colo.	2,000,000	1,625,000	1	214 083	July 1906	.00½
Daly Judge, g. s. l.	Utah	300,000	300,000	1	225,000	Apr. 1907	.37½
Daly West, g. s. l.	Utah	3,600,000	180,000	20	5,877,000	Dec. 1907	.30
De Lamar, g. s	Ida	500,000	80,000	5	835,200	Sept. 1908	.24
Doctor Jack Pot.	Colo.	3,000,000	3,000,000	1	277,000	June 1906	.00½
Doe Run, l.	Mo.	10,000,000	59,062	100	1,765,005	Dec. 1908	1.50
Elkton Con., g.	Colo.	3,000,000	2,500,000	1	2,191,961	Nov. 1908	.01½
El Paso, g.	Colo.	2,500,000	2,450,000	1	1,315,545	Sept. 1908	.01
Fed. Sm., com.	Idaho	10,000,000	60,000	100	2,708,750	Jan. 1909	1.50
Federal Sm., pf.	Idaho	20,000,000	120,000	100	4,121,250	Dec. 1908	1.75
Findley, g.	Colo.	1,250,000	1,250,000	1	337,500	Sept. 1906	.01
Florence, g.	Nevada	1,250,000	1,050,000	1	420,000	Nov. 1908	.10
Frances-Mohawk,g	Nevada	1,000,000	910,000	1	546,000	Jan. 1908	.05
Gemini-Keystone	Utah	500,000	5,000	100	2,000,000	Aug. 1907	10.00
Gold King Con	Colo.	5,750,370	5,750,370	1	1,407,504	May 1905	.01
Goldfield Con., g.	Nevada	50,000,000	3,532,471	10	706,494	Nov. 1907	.10
Grand Central, g.	Utah	250,000	250,000	1	1,321,250	Dec. 1907	.04
Gwin Mine, Dev., g.	Cal	1,000,000	100,000	10	496,000	Apr. 1906	.05
Hecla, s. l.	Idaho	250,000	1,000,000	0.25	1,690,000	Dec. 1908	.01½
Homestake, g.	S. D.	22,000,000	218,400	100	23,827,440	Jan. 1909	.50
HornSilver,g.s.c.z.l	Utah	10,000,000	400,000	25	5,642,000	Sept. 1907	.05
Imperial, c.	Ariz.	5,000,000	500,000	10	300,000	June 1907	.20
Inter'l Nickel, pf.	N. Y.	12,000,000	89,126	100	1,737,957	Feb. 1909	1.50
Iron Silver	Colo.	10,000,000	500,000	20	4,100,000	Oct. 1907	.10
Jamison, g.	Cal	3,900,000	390,000	10	339,300	Jan. 1909	.02
Jerry Johnson.	Cal	2,500,000	2,500,000	1	86,700	Jan. 1908	.01
Kendall, g.	Mont	2,500,000	500,000	5	1,275,000	Oct. 1908	.02
Liberty Bell,g. s.	Colo.	700,000	130,551	5	130,440	Jan. 1907	.15
Lightner, g.	Cal	125,000	102,255	1	253,081	Oct. 1906	.05
Lower Mammoth, g	Utah	190,000	190,000	1	57,000	Sept. 1907	.07½
Mammoth, g. s. l.	Utah	10,000,000	400,000	2.50	2,220,000	Mar. 1908	.05
Mary McKinney, g.	Colo.	2,500,000	1,309,252	1	841,093	Dec. 1908	.02
May Day, g. s. l.	Utah	800,000	800,000	1	108,000	Sept. 1908	.01½
Mohawk, c.	Mich	2,500,000	105,000	25	1,850,000	Feb. 1909	2.00
Mont. Ore Purch.	Mont	2,500,000	80,833	25	9,437,274	Jan. 1907	15.00
Nevada Hills, s.g.	Nevada	5,000,000	746,000	5	373,000	Dec. 1907	.10
New Century, z., l.	Mo.	300,000	300,000	1	213,000	Dec. 1906	.01
Newhouse M. & S.c.	Utah	6,000,000	600,000	10	300,000	Sept. 1907	.50
New Idria, q	Cal	500,000	100,000	5	1,080,000	Jan. 1909	.30
New Jersey Zinc	U S.	10,000,000	100,000	100	12,000,000	May 1908	4.00
North Butte	Mont	6,000,000	400,000	15	6,400,000	Dec. 1908	1.00
North Star, g	Cal	2,500,000	250,000	10	1,911,988	Dec. 1908	.75
Old Dominion, c.	Ariz.	8,750,000	293,245	25	720,710	Dec. 1908	.50
OldDominion,M&Sc	Ariz.	5,000,000	162,000	25	364,500	Dec. 1908	1.00
Ophir, g. s	Nevada	604,800	201,600	3	1,816,360	May 1908	.10
Osceola, c	Mich	2,500,000	96,150	25	7,420,250	Jan. 1909	2.00
Parrot, c,s.	Mont	2,800,000	229,850	10	6,807,649	Sept. 1907	.25
Pennsylvania, g.	Cal	5,150,000	51,500	100	284,925	July 1905	.10
Pitts. L. & Z., l.z.	Mo	1,000,000	1,000,000	1	20,000	July 1907	.02
Portland, g.	Colo.	3,000,000	3,000,000	1	8,227,080	Jan. 1909	.04
Quartette, g. s.	Nevada	1,000,000	100,000	10	375,000	July 1907	.20
Quincy, c	Mich	3,750,000	110,000	25	18,450,000	Dec. 1908	1.00
Rocco Homest'k,l.s.	Nevada	300,000	300,000	1	112 000	Dec. 1905	.02
Sacramento, g, q.	Utah	1,000,000	1,000,000	1	255,000	Nov. 1906	.00½
St. Joseph, l.	Mo.	20,000,000	1,000,000	10	6,158,357	Dec. 1908	.15
Silver Hill, g. s	Nevada	108,000	108,000	1	81,000	June 1907	.05
Silver King, g. s. l †	Utah	3,000,000	150,000	20	11,187,500	July 1907	.33½
Silver King Co't'n.†	Utah	6,250,000	1,224,425	5	918,402	Jan. 1909	.30
Shannon, c.	Ariz.	3,000,000	300,000	10	450 000	July 1907	.50
Snowstorm, s. l.	Ida	1,500,000	1,500,000	1	645,000	Jan. 1909	.03
Standard Con., g. s.	Cal	2,000,000	178,394	10	5,194,130	Dec. 1908	.10
Stratton'sIndepend	Colo.	5,500,000	1,000,007	5	4,895,865	Apr. 1906	.12½
Swansea, g. s. l.	Utah	500,000	100,000	5	329,500	Mar. 1907	.05
Tamarack, c	Mich	1,500,000	60,000	25	9,420,000	July 1907	4.00
Tennessee, c.	Tenn	5,000,000	200,000	25	2,056,250	Sept. 1908	1.25
Tomboy, g. s	Colo.	1,750,000	300,000	5	2,016,000	Dec. 1908	.48
Tonopah of Nev.	Nevada	1,000,000	1,000,000	1	4,250,000	Jan. 1909	.25
Tonopah Belmont.	Nevada	2,000,000	1,500,000	1	600,000	Apr. 1907	.10
Tonopah Ext'nsion	Nevada	1,000,000	928,433	1	283,030	Apr. 1906	.15
Tonopah Midway.	Nevada	1,000,000	1,000,000	1	250,000	Jan. 1907	.05
Uncle Sam, g.s.l.	Utah	500,000	500,000	1	295,000	Dec. 1908	.02
United States, com.	Utah	37,500,000	350,933	50	1,798,099	Jan. 1909	.50
United States, pfd.*	Utah	37,500,000	485,845	50	4,881,377	Jan. 1909	.87½
United Cop. com.	Mont	75,000,000	450,000	100	5,962,500	Aug. 1907	1.75
United, c. pf	Mont	5,000,000	50,000	100	1,500,000	May 1907	3.00
United, z. l., pf.	Mo.-Kan.	500,000	19,556	25	312,782	Jan. 1908	.50
United Verde, c.	Ariz.	3,000,000	300,000	10	20,835,322	Jan. 1909	.75
U.S. Red. & Ref. Pf.	Colo.	4,000,000	39,458	100	1,005,504	Oct. 1907	1.50
Utah, g.(Fish Sp'gs)	Utah	1,000,000	100,000	10	323,000	Feb. 1909	.02
Utah Con., c.	Utah	1,500,000	300,000	5	7,350,000	Jan. 1909	.50
Utah Copper	Utah	7,500,000	725,950	10	725,950	Dec. 1908	.50
Victoria, Utah	Utah	250,000	250,000	1	177,500	Mar. 1907	.04
Vindicator Con., g.	Colo.	1,500,000	1,500,000	1	1,980,000	Jan. 1909	.03
Wolverine, c.	Mich	1,500,000	60,000	25	5,100,000	Oct. 1908	5.00
Work, g	Colo.	1,500,000	1,500,000	1	172,500	July 1908	.01
YankeeCon	Utah	1,000,000	1,000,000	1	182,500	Jan. 1907	.03
Yellow Aster, g.	Cal	1,000,000	100,000	10	958,789	Aug. 1907	.20

*Previous to consolidation $1,436,250 were divided. †Amalgamated.

Coal, Iron and Other Industrials—United States

Name of Company and Location.		Author-ized Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Allis-Chalmers, pf.	U. S.	$25,000,000	161,500	100	$3,108,875	Feb. 1904	$1.75
Amer. Ag. Chem., pf.	U. S.	20,000,000	181,538	100	9,547,342	Oct. 1908	3.00
American Cement.	Pa.	2,000,000	200,000	10	1,288,000	Jan. 1909	.30
American Coal.	Md.	1,500,000	50,000	25	2,492,500	Sept. 1908	1.25
Bethlehem Steel, pf.	Pa.	15,000,000	150,000	100	900,000	Nov. 1906	.75
Cambria Steel.	Pa.	50,000,000	900,000	50	9,450,000	Feb. 1909	.75
Central C. & C., com.	Mo.	5,125,000	51,250	100	2,536,875	Jan. 1909	1.50
Central C. & C., pf.	Mo.	1,875,000	18,750	100	1,453,125	Jan. 1909	1.25
Col. & Hock. C.& I,pf.	Ohio	7,000,000	69,244	100	388,818	Apr. 1908	1.50
Consolidated Coal.	Ill.	5,000,000	50,000	100	350,000	July 1904	1.00
Consolidation Coal.	Md.	10,250,000	102,500	100	10,441,650	Jan. 1909	3.50
Crucible Steel, pf.	Pa.	25,000,000	244,365	100	8,186,228	June 1907	1.50
Empire S. & I., pf.	N. J.	2,500,000	25,000	100	933,033	Jan. 1909	1.50
Fairmont Coal,	W. Va.	12,000,000	120,000	100	1,980,000	Jan. 1909	2.00
General Chem. Com.	U. S.	12,500,000	74,103	100	2,148,987	Dec. 1908	1.00
General Chem., pf.	U. S.	12,500,000	100,000	100	6,255,000	Jan. 1909	1.50
International Salt.	Penn.	30,000,000	182,280	100	911,400	Dec. 1906	1.00
Jeff. & Cl'f C. & I., cm.	Pa.	1,500,000	15,000	100	330,000	Aug. 1905	5.00
Jeff. & Cl'f. C. & I.,pf.	Pa.	1,500,000	15,000	100	862,500	Aug. 1908	2.50
Kern River Oil.	Cal.	2,000,000	20,000	100	84,000	July 1908	.10
Lehigh Coal & Nav.	Pa.	19,113,000	382,260	50	*15,014,890	Nov. 1908	2.00
Maryland Coal,pf.	Md.	2,000,000	18,850	100	‡2,013,997	Dec. 1908	2.50
Monon R. Coal, pf.	Pa.	10,000,000	100,000	100	2,324,000	July 1908	3.50
NationalCarbon,com.	U. S.	5,500,000	55,000	100	715,000	Apr. 1908	1.00
National Carbon, pf.	U. S.	4,500,000	45,000	100	3,071,250	Nov. 1908	1.75
National Lead, com.	N. Y.	15,000,000	149,054	100	3,092,872	Jan. 1909	1.25
National Lead, pf.	N. Y.	15,000,000	149,040	100	17,894,248	Dec. 1908	1.75
Nat'l Steel & Wire,pf.	N. Y.	5,000,000	25,778	100	631,561	May 1906	1.75
New Central Coal	Md.	1,000,000	50,000	20	390,000	Nov. 1908	.40
New River Coal, pfd.	W. Va.	4,000,000	37,617	100	451,405	Nov. 1908	1.50
Pacific Coast Borax.	Cal.	2,000,000	19,000	100	2,086,500	Aug. 1905	1.00
Peerless Oil.	Cal.	1,000,000	92,000	10	711,000	June 1908	.06
Penna. Salt.	Pa.	3,000,000	60,000	50	15,098,000	Oct. 1908	3.00
Penna. Steel, pfd.	Pa.	25,000,000	165,000	100	8,662,500	Nov. 1908	3.50
Phila. Gas, com	Pa.	36,000,000	664,800	50	*24,264,600	Feb. 1909	.75
Phila. Gas, pf.	Pa.	6,000,000	120,000	50	2,850,000	Sept. 1908	1.25
Pittsburg Coal, pf.	Pa.	32,000,000	297,010	100	11,434,962	Apr. 1905	1.75
Pocahontas C. C., pf.†	W. Va.	2,800,000	28,000	100	252,000	Jan. 1909	3.00
Pocahontas C. C.,cm†	W. Va.	5,000,000	45,200	100	†406,800	Oct. 1908	3.00
Republic I. & S., pfd.	Ill.	25,000,000	204,169	100	6,045,338	Apr. 1908	1.75
Sloss-Sheffield, com.	Ala.	10,000,000	100,000	100	1,883,000	Dec. 1908	1.00
Sloss-Sheffield, pf.	Ala.	10,000,000	67,000	100	4,221,000	Jan. 1909	1.75
Standard Oil.	U. S.	100,000,000	970,000	100	629,522,905	Dec. 1908	10.00
Tenn. C. & I., com.	Tenn.	22,558,600	225,536	100	3,583,060	Nov. 1907	1.00
Tenn. C. & I., pf.	Tenn.	248,000	2,480	100	390,040	Nov. 1907	2.00
Texas & Pacific Coal.	Texas	2,500,000	23,940	100	1,711,710	June 1908	1.00
United Metals Selling	U. S.	5,000,000	50,000	100	5,875,000	Jan. 1909	5.00
U. S. SteelCorp.,cm.,	U. S.	550,000,000	5,083,025	100	81,306,544	Mar. 1909	.50
U. S. Steel Corp., pf.	U. S.	360,281,100	3,602,811	100	225,280,192	Mar. 1909	1.75
Va. Carolina Ch., pf.	U. S.	20,000,000	180,000	100	14,340,869	Jan. 1909	2.00
Warwick I. & S.	U. S.	1,500,000	148,671	10	517,739	Nov. 1908	.80
Westmoreland Coal.	Pa.	3,000,000	60,000	50	8,880,000	Oct. 1908	2.50

*Since 1894. †Since 1907. ‡Since 1890.

Canada, Mexico, Central and South America

Name of Company and Location.		Author-ized Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Amistad y Conc'rdia.	Mex.	$480,000	9,600	50	$417,070	Apr. 1908	$1.96
Batopilas	Mex.	9,000,000	446,268	20	† 55,784	Dec. 1907	.12½
British Columbia, c.	B. C.	3,000,000	503,000	5	201,200	Sept. 1907	.40
Buffalo, s.	Ont.	1,000,000	900,000	1	307,000	Feb. 1909	.01
Butters' Salvador, g.	Salv.	750,000	150,000	5	600,000	Apr. 1905	.25
Cobalt Central, s.	Ont.	5,000,000	4,761,500	1	95,230	Feb. 1909	.02
Coniagas (Cobalt)	Ont.	4,000,000	300,000	5	720,000	July 1908	.15
Consolidated M & S.	B. C.	5,500,000	53,552	100	781,885	Nov. 1907	1.25
Crow's Nest Pass	B. C.	4,000,000	160,000	25	2,018,648	July 1907	.62½
Crown Reserve, s.	Ont.	1,750,000	1,750,000	1	350,000	Jan. 1909	.16
Dolores, g. s.	Mex.	2,000,000	400,000	5	540,000	Feb. 1909	.15
Dominion Coal, com.	N. S.	15,000,000	150,000	100	3,150,000	Jan. 1909	1.00
Dominion Coal, pf.	N. S.	3,000,000	30,000	100	‡630,000	Feb. 1908	3.50
Dos Estrellas, g. s.	Mex.	150,000	300,000	0.50	3,780,000	Jan. 1909	1.00
El Oro, g. s.	Mex.	5,750,000	1,080,000	5	4,989,600	July 1908	.36
Esperanza, s. g.	Mex.	2,275,000	455,000	5	9,222,400	Oct. 1908	.87½
Foster Cobalt, s.	Ont.	1,000,000	1,000,000	1	50,000	Jan. 1907	.05
Granby Con.	B. C.	15,000,000	135,000	100	3,508,630	Dec. 1908	2.00
Greene Con. Copper.	Mex.	8,640,000	864,000	10	6,137,800	Mar. 1907	.40
GreenGold-Silv'r,pfd.	Mex.	3,000,000	300,000	10	120,000	Mar. 1907	.40
Guanajuato	Mex.	3,000,000	540,000	5	74,250	Oct. 1906	.07
Guanajuato D., pfd. s	Mex.	1,000,000	10,000	100	30,000	July 1908	3.00
Guggenheim Expl.	Mex.	17,000,000	105,000	100	5,010,000	Jan. 1909	2.50
Hinds Con., g.s.c.l.	Mex.	5,000,000	5,000,000	1	100,000	Feb. 1908	.02
Kerr Lake, s.	Ont.	3,000,000	600,000	5	970,000	Mar. 1909	.20
La Rose Con., s.	Ont.	7,500,000	1,143,368	5	400,179	Jan. 1909	.20
LeRoi, Ltd., g.	B. C.	5,000,000	200,000	25	425,000	Dec. 1906	.48
LeRoi No. 2, g.	B. C.	3,000,000	120,000	25	831,600	July 1908	.48
McKinley-Darragh,s.	Ont.	2,500,000	2,000,000	1	480,000	Jan. 1909	.05
Mex. Con. M. & S. Co.	Mex.	2,500,000	240,000	10	660,000	Mar. 1908	.25
Mex.Mill.& Trans.pfd	Mex.	2,000,000	12,000	100	35,450	Jan. 1908	3.00
Mines Co. of Am.	Mex.	2,000,000	2,000,000	1	3,465,000	Feb. 1909	.02
N. Y. & Hond. Ros.	C. A.	1,500,000	150,000	10	2,467,000	Jan. 1909	.10
Nipissing, s	Ont.	6,000,000	1,200,000	5	2,340,000	Jan. 1909	.25
N. S. St. & Coal, com.	N. S.	5,000,000	49,876	100	1,067,856	Apr. 1908	1.50
N. S. St. & Coal, pf.	N. S.	1,080,000	10,300	100	458,350	Oct. 1908	2.00
Penoles*	Mex.	250,000	2,500	100	8,630,000	Dec. 1907	20.00
Peregrina, pfd. s.	Mex.	1,000,000	10,000	100	188,656	Sept. 1908	3.50
Pinguico, pfd. s.	Mex.	2,000,000	20,000	100	240,000	Oct. 1908	3.00
Platanillo	Mex.	500,000	206,989	1	5,580	Sept. 1906	.00
Reco, g. s.l	B. C.	1,000,000	958,000	1	327,082	Apr. 1906	.02
Securities Corp., pfd.	Mex.	200,000	2,000	100	42,699	July 1908	3.50
Silver Queen, s.	Ont.	1,500,000	1,500,000	1	345,000	Nov. 1908	.05
Temiskaming, s.	Ont.	2,500,000	2,500,000	1	375,000	Jan. 1909	.06
Tesuitlan Copper	Mex.	1,000,000	10,000	100	.....	Dec. 1908	1.20
Tilt Cove, c.	N. F.	1,000,000	89,000	2	495,630	May 1908	.55
Tretheway, s.	Ont.	1,000,000	945,450	1	217,463	Dec. 1908	10.
Tyee, c	B. C.	940,000	180,000	5	201,600	Aug. 1907	.63

*Mexican Currency. †Since reorganization. ‡Since August, 1905.

Industrials

The Coahuila Mining and Smelting Company, Ltd., of Viesca, Coahuila, Mexico, will be interested in receiving descriptive literature on pneumatic ore-separating machinery.

McClintic-Marshall Construction Company, designers, manufacturers and erectors of steel buildings, bridges, etc., Pittsburgh, Penn., has opened an office in 839 Central building, Seattle, Wash. C. F. Boyce is the sales representative in charge.

The Youngstown Car Manufacturing Company, builders of ore and mining cars, has recently moved its Chicago office and is now located at 1603 Fisher building. The office is in charge of Charles B. Owens, formerly of the American Car and Foundry Company.

Wm. Ainsworth & Sons state that they have received an order for three 18-in. precision wye levels and two 5-in. precision transits from the Aqueduct commission in charge of the construction of the Los Angeles aqueduct, awarded chiefly on account of the interchangeability of parts, rigidity and workmanship.

The South Scranton tunnel of the Scranton Gas and Water Company is 4200 ft. long and 7x10 ft. in section. All of the drills (16 in number) used on this extensive piece of work were furnished by the Wood Rock Drill Company, of Paterson, N. J. They were only used after being in active competition with the drills of other manufacturers.

The Dearborn Drug and Chemical Works reports that the general business of the company for the last six months of 1908 was larger than for any other six months in its history, indicating the quick return of prosperous business conditions. The percentage of increase the past six months, and especially for January, in the eastern department of the company, is particularly gratifying.

Robert W. Hunt & Co., consulting and inspecting engineers, has engaged the services of John Cargill, who will make his headquarters at the firm's New York office, 90 West street. He will largely devote his attention to the examination and report upon railway and other corporate properties, for which his experience gained while connected with the Pennsylvania lines, British Westinghouse, Metropolitan Railway Company of London, and other organizations, has prepared him.

The Cyclone Drill Company has rented offices in Chicago. In the past few years the company has secured a large portion of its business from Chicago from mining properties in the North and West. The business from that point having grown to such an extent it was recently decided to open an office there to take care of the trade to better advantage for both the customers and the company. J. F. Munn, who has had charge of the core drill department at the factory for several years, will take charge of the Chicago office. Mr. Munn has had a very broad experience in drill work, covering both core and churn drilling, and his experience will be valuable to the buyers of prospecting machinery. R. R. Sanderson will succeed Mr. Munn at the Orrville office. The Chicago address of the company is 419 Fisher building.

The U. S. Flexible Tubing Company, whose San Francisco establishment has been temporarily located at Beale and Mission streets, has now moved to its permanent location, 63 and 65 Main street, San Francisco, Cal. The new quarters will enable the company to care for the wants of its patrons promptly The new establishment will afford considerable space required to handle the long lengths of metal hose for installing connections and the testing of same, as the company will not allow metal hose to leave its establishment without being subjected to a thorough test. The popularity of metal hose is ever increasing and with it the company endeavors to meet the demand. The new quarters will also enable it to carry a larger stock of metal hose so as to meet all requirements. A cordial invitation is extended to all the company's friends to call at its new establishment.

A complete line of air compressors as built by the Thos. H. Dallett Company, of Philadelphia, Penn., brings out many excellent and unique ideas in compressor design. The frame is of the open-fork center crank type, and of an especially massive and rigid design to obtain on each size compressor a greater range of capacity by substituting, when desired, a cylinder of the next larger size than the standard to operate at 100 lb. pressure. For example: On an 8-in. stroke compressor the regular cylinder for 100 lb. pressure is 8 in. in diameter, but a 10-in. diameter cylinder can be substituted and still operate at the above pressure, whereby a greater volume of air is obtained with but a slight increase in cost of machine. In the case of duplex compressors with compound steam cylinders, a difficulty has been, if the machine stops with the high pressure side on the dead center, which occurs frequently, it will not start automatically, this being due to the fact that but one side (the high pressure) takes steam from the line. This trouble has been overcome by using a reducing valve of standard make, which reduces the live steam pressure for use in the low pressure cylinder, thus if the high pressure side stops on the dead center, live steam is fed to the low pressure cylinder through the reducing valve, starting the compressor. It is obvious that steam from the boiler is taken into the low pressure side only when starting, otherwise the operation is identical with any compound machine. The cross head is a new-type box pattern, made of semi-steel. Its shoes are adjustable and of large bearing surface. The upper shoe is lubricated by means of a sight-feed lubricator, and the lower shoe runs continually in a bath of oil. One of the features of this design is the side openings, which allow easy access to the cross-head shoe binder bolts. The cross-head pin is tool steel, hardened and ground. It is fitted to tapered seats in the cross-head, drawn tight on the tapers by means of a nut held in position by a pin. Means are provided for turning one-quarter revolution in case it wears flat on the two bearing sides, thus doubling the wearing capacity. The air intake and discharge valves have been given most careful consideration, and are special features of these compressors. The intake valve is of the automatic poppet type, contained in a malleable-iron cage. The cage is one piece, and combines both seat for the valve and guide for the valve stem. The cage is threaded and screws into the wall of the air-intake chamber only, and is simply seated in a recess on the main cylinder wall, using thin corrugated copper gaskets to secure a tight joint. A hexagonal recess has been cast in all cages to accommodate a special cast-steel wrench for use in removing and replacing valve cages. The valve cage cap acts as a lock nut for holding the cage in place after it has been screwed down on its seat in the cylinder. It is provided with a hexagonal projection, and the same wrench can be used here as on the valve cage. In the case of compound machines, corrugated copper gaskets are placed under the valve cage caps on the high pressure cylinder to insure against any leakage, as the discharge pressure from the low pressure cylinder is constantly at these joints. The valve proper is a special alloy-hardened steel, with seat and stem ground to gage. The valve spring is of phosphor bronze and of the right proportion to give the valve an easy opening and a quick closure. Much annoyance and trouble has been caused on certain makes of intake valves due to the spring holder shearing off or working loose. The cause of this trouble is due to the sudden stopping of the valve on its seat, which tends to drive the spring holder off the valve stem. This effect may be likened to driving a hammer on its handle by means of hitting the handle on its opposite end. The principle involved is identical. To eliminate this defect and the trouble caused by threading and pinning the spring holder to the valve stem, solid ends have been employed by some builders, which necessitates a split guide and complicates the valve parts. On the "Dallett" valve the spring holder comprises a split taper ring set in a recess on the valve stem and held together and tight to the stem by means of a solid taper ring slipping down over it. The hammering of the valve on its seat tends to tighten the spring holder on the stem instead of driving it off, due to the action of the taper. The discharge valve is of the automatic poppet type contained in a valve cage of malleable iron. The method of seating in the cylinder and locking in its seat is identical with that of the intake valve. A projection or boss has been provided on the valve cap which acts as a positive stop for the valve when it has reached a lift giving a full opening area, and does away with fluttering. This same projection on the cap also acts as a spring guide for the valve spring. The intercooler plays a very important part in economical operation of a two-stage machine. The "Dallett" intercooler is of large cooling area, employing the return-flow type of water circulation, using baffle plates to deflect the flow of air and aid in its effectual contact with the cooling tubes. This method is very efficient in reducing the temperature of the air between stages to approximately the original temperature, thus tending to reduce the final or discharge temperature and also the horsepower required for a given capacity. The nest of cooling tubes may be removed intact from the intercooler box without disturbing any of the piping, as unions are supplied to obviate this feature. The intercooler is supplied with pop safety valve, pressure gage and drain valve. In a compressed-air plant the demand for air is often of such an intermittent character that automatic regulation of the supply of air in accordance with the demand becomes a necessity. The belt-driven machines are provided with an unloading device which automatically unloads the air cylinder. When a certain determined pressure is reached in the air receiver, one or more inlet valves at both ends of the air cylinder are held open and the load is taken off the compressor, allowing it to run light until the pressure drops in the receiver, upon which the valves are released and air compression is resumed. On the steam machines, a combined speed and pressure governor is used. This governor unloads the air cylinder exactly the same as on a belt-driven machine, and at the same time it controls the speed, allowing a single steam machine to just turn over when unloaded, and bringing a duplex or compound machine to a dead stop. By this means a great saving in steam is effected and the wear and tear on the working parts, as in the case of continuous running machines, is reduced. A complete unloading equipment is furnished with all machines. The compressors described are built in sizes from 8-in. stroke up to and including 16-in. stroke, and give a range of capacity from 79 cu.ft. of free air per min. to 1200 cu.ft. Special machines for any capacity, pressure or service, or any standard machine direct connected to motor, water wheel or gas engine, can be furnished in addition to the standard line.

Trade Catalogs

Lehigh Car Wheel and Axle Works, Fullerton, Penn. Catalog. Fuller-Lehigh pulverizer mill. Illustrated, 45 pages, 9x12 inches, paper.

John V. N. Dorr, Equitable Bldg., Denver, Colo. Catalog. Dorr classifier and Dorr continuous slime thickener. Illustrated, 24 pages, 6x9 inches, paper.

Hunt Filter Company, Metropolis Bank building, San Francisco, Cal. Catalog. Hunt continuous slime filter. Illustrated, 8 pages, 6x9 inches, paper.